

## THE ECONOMIC, SYMBOLIC, AND SOCIAL IMPORTANCE OF THE “KEÑUA” (*POLYLEPIS* SPP.) DURING PREHISPANIC TIMES IN THE ANDEAN HIGHLANDS OF BOLIVIA

José M. Capriles<sup>1</sup> & Eliana Flores Bedregal<sup>2</sup>

<sup>1</sup> Carrera de Arqueología, Universidad Mayor de San Andrés, P.O. Box 499, La Paz, Bolivia

<sup>2</sup> Instituto para la Conservación e Investigación de la Biodiversidad, P.O. Box 5829, La Paz, Bolivia

**Resumen.** Las investigaciones sobre la keñua (*Polylepis* spp.) principalmente se refieren a su distribución, ecología, y silvicultura; solamente algunos estudios se enfocan en la importancia social dada a esta planta tanto en el pasado como en el presente. En este artículo, nosotros exploramos la importancia económica, simbólica y social que la keñua tuvo en las tierras altas de Bolivia durante el pasado prehispánico, empleando un acercamiento arqueológico a través de una revisión extensa de la literatura y estableciendo hipótesis para futuras investigaciones. Proponemos que su utilidad dio beneficios múltiples a las sociedades andinas, y por lo menos en los casos de los grupos Carangas e Inca, éstos llegaron más allá de su valor económico y su significado religioso. Entendiendo la importancia económica y simbólica de estas especies nosotros interpretamos el valor cultural dado a la keñua, específicamente durante el período Horizonte Tardío (1470-1532 d.C.) considerando que se dispone de mayores datos arqueológicos y etnohistóricos sobre este período de tiempo. Concluimos que la keñua fue un componente indispensable para la vida cotidiana de los Carangas, Incas, y posiblemente otras sociedades andinas que incluso permitió generar un uso sustentable de este recurso natural.

**Abstract.** The research on the keñua tree (*Polylepis* spp.) mostly refers to its distribution, ecology, and forestry; there are few studies that deal with the social importance given to this plant in the past as in the present. In this article, we explore the economic, symbolic, and social importance that the keñua had in the Bolivian highlands during prehispanic times, employing an archaeological approach and through an extensive literature review, and we establish hypotheses for further research. We propose that its utility gave multiple benefits to the Andean societies, at least in the cases of the Carangas and Inca groups, reaching beyond economic values and religious meaning. By understanding the economic and symbolic importance of this species we interpret the cultural value given to the keñua, specifically during the Late Horizon period (A.D. 1470–1532) considering there is more archaeological and ethnohistorical data from this period of time. We conclude that the keñua became an indispensable component in the everyday life of the Carangas, Incas, and perhaps other Andean societies, that even allowed the development of a sustainable use of this natural resource. *Accepted 23 May 2002.*

**Key words:** Archaeology, Bolivian highlands, Carangas, Incas, keñua, *Polylepis* spp.

### INTRODUCTION

The keñua or kewaña (*Polylepis* spp.), as one of the few strictly Andean tree genera, constituted one of the most important group of plants for cultural development in the Andean highlands during prehispanic times. Most of the studies on these plants mainly focus on their natural history, distribution, forestry, ecology, and conservation (e.g., Liberman 1986, Simpson 1986, Anze & Huanca 1993, Kessler & Driesch 1993, Hensen 1994, Ibisch 1994, Kessler 1995, Ejeldsã & Kessler 1996). Therefore the value and uses that these trees had until now, as well as their social importance in the prehispanic historical con-

text, remain mainly undetermined. The lack of studies on the use of the *Polylepis* trees and woodlands in the past is simultaneously a restriction and a challenge for the development of this work. Accordingly, this article synthesizes dispersed bibliographical information and also makes suggestions and assumptions that will require further analysis and fieldwork research. We hope to contribute to the recent line of investigation in the fields of archaeological and paleoethnobotanical studies that focuses on the cultural importance of certain plants and their environmental landscapes in the past (e.g., Johannessen & Hastorf 1990, Hastorf & Johannessen 1991, Hastorf 1998, Angelo & Capriles 2000). We also believe that, with a greater understanding of the use and social

<sup>1</sup> e-mail: eliflor@ceibo.entelnet.bo

meaning that the *Polylepis* species had, it will be possible towards make significant contributions to the implementation of conservation policies oriented to the preservation and sustainable use of this important Andean biodiversity resource (e.g., Fjelds  & Kessler 1996).

The ke ua (*Polylepis* spp.) belongs to the Rosaceae family, and is composed of trees and bushes with gnarled trunks not higher than 15 meters, evergreen, with brown-reddish bark that peels off in paper-like sheets. It grows along the Andean mountain range, from Venezuela to Chile and Argentina (Simpson 1986). In Bolivia, Kessler (1995) has identified 9 species, at least 8 subspecies, and several ecotypes and hybrids. According to this author the potential surface area of *Polylepis* forests in Bolivia is about 55000 km<sup>2</sup>, but only about 10% still remains, mostly as open bush vegetation or in a few relict forests distributed across the western Andean highlands.

Considering that the objective of the present study is to determine the economic, symbolic, and social value of the ke ua during the prehispanic times at the Andean highlands of Bolivia, this proposal is based on an analytic and extensive literature review of archaeological, ethnohistoric, and ethnographic data, mainly related to the Carangas ethnic group. This study will focus specifically on the Late Horizon, which is a cultural chronological period defined for the Andean region that ranges from A.D. 1470 to 1532, and is mainly characterized by the expansion of the Inca empire (see Rowe 1962). Therefore, we will include some notes about the importance of the ke ua for the Incas, who also made relevant use of this resource and interacted with the Carangas during this period.

## RESULTS AND DISCUSSION

*Historical framework.* A brief history of high Andean forest destruction has been drawn by Kessler & Driesch (1993), see also Fjelds  & Kessler (1996), based mainly on palynological studies. They proposed that the *Polylepis* and other forestry species which covered a great part of the highlands and sierra were destroyed gradually. Starting from the arrival of the first hunters and gatherers at the end of the last glacial period, large areas of vegetation were destroyed in hunting by fire (Kessler & Driesch 1993). The wood was also employed as firewood and in construction. This exploitation gradually increased with Andean cultural development.

During the early agricultural phase (7500–3000 B.P.) a great climatic variability, accentuated by the “El Ni o” climate phenomenon, was among the main factors contributing to the degradation of the Andean landscape. This climatic change promoted the overexploitation of natural resources, exceeding the productive capacity of the ecosystems. Kessler & Driesch (1993) mention that the use of fire for the improvement of grasslands in this period was moderate, because camelids do not like grasses favored by burning. A high population growth developed in the Andes during this cultural boom period (3000 B.P. - A.D. 1532), and a heavy colonization from the highlands to the interandean valleys took place, with the consequent overexploitation of natural resources.

This view has recently been criticized by Baied (1999), who analyzed palynological, archaeological, and ethno-archaeological data, demonstrating that the human impact on *Polylepis* woodlands was not as severe as Kessler & Driesch (1993) initially supposed. Baied (1999) concludes that *Polylepis* was severely affected by the Pleistocene-Holocene transition causing much forest contractions, but some species (e.g., *P. tarapacana*, *P. tomentella*) were able to expand their original distribution due to their successful evolutionary adaptation.

On the other hand the colonial period was, without any doubt, when the greatest exploitation of the high Andean forests occurred, mainly to supply firewood for the mineral treatment facilities of Potos  and other mines, as well as for construction uses and domestic fuel (Kessler & Driesch 1993). It seems that the consumption of firewood by a single Spaniard during only one day, equaled the consumption of a native throughout an entire month (Ansi n 1986, Kessler & Driesch 1993). The deforestation was drastic and rapid, and the reforestation policies enforced were ineffective. Furthermore, the introduction of exotic livestock (mainly cattle, sheep, and goats), new agricultural practices (especially the plow), decline and abandonment of the traditional ones (systems of irrigation, agricultural terraces, elevated fields), as well as the change in the social system, were important factors in the degradation of *Polylepis* forests and the Andean environment in general. Finally, since the republican time (1825) and through the period of agrarian reform (1953), the process of forest degradation and unsustainable agricultural practices has continued (Fjelds  & Kessler 1996).

Based on this framework, we proposed the following questions: What were the subsistence benefits

and economic profits that the indigenous population obtained from the high Andean *Polylepsis* forests during prehispanic times? and what were the exploitation strategies that these people developed in order to extract and employ these resources?

*The economic importance of the keñua for the Carangas.* The ethnic group of the Carangas inhabited the territory of the current western Department of Oruro and south of the Department of La Paz in Bolivia, where some of the best preserved forests of keñua (*Polylepsis tarapacana*) have been reported (Fjeldså & Kessler 1996). Some of those form a vast belt of vegetation around the Sajama mountain (Lieberman 1986, Cárdenas 1989, Fjeldså & Kessler 1996). The Carangas territory was defined by the rivers Mauri and Desaguadero to the north, the Cordillera Oriental to the east, the Lakajahuira river and the Coipasa salt lake to the south, and the Cordillera Occidental to the west (Riviere 1979, 1983; Saignes 1986).

Research done by Michel (1996, 2000) demonstrates that since A.D. 300 the Carangas developed independently of other highland cultures such as the Tiwanaku. However, during the Late Intermediate Period (A.D. 1100–1470) and the Late Horizon (A.D. 1470–1532) characterized by the Inca occupation of the region, they formed part of the same social organization system that distinguished the cultural life of most of the Andean highlands, together with their neighbors the Pacajes, Charcas, Soras, and Quillacas (Saignes 1986, Gisbert *et al.* 1987). This social organization has been recently defined as a segmentary chiefdom, composed of corporate groups, based on kinship relations, and organized through inclusive segmental hierarchies, of which the minimal sociopolitical unit was the *ayllu* (well known ethnohistorically and ethnographically [e.g., Platt 1982, Izko 1992, Albarracín-Jordan 1996]). On the other hand, the Carangas' economy was characterized by agricultural production, mainly of tubers such as the potato (*Solanum tuberosum*) and oca (*Oxalis tuberosa*), as well as the quinoa (*Chenopodium quinoa*). Their farming technology allowed them to cultivate at heights above 4000 m. a.s.l., as the archaeological evidence of agricultural terraces in the Sajama region at that elevation demonstrates (Michel 1996). Additionally, their subsistence was primarily dependent on llama and alpaca herding, mostly concentrated in the puna wetlands or *bofedales* (Riviere 1979).

With reference to the use that the Carangas made of the *Polylepsis* woodlands, we can classify the fol-

lowing forms of exploitation: direct and indirect. In the direct type, the keñua was extracted as a forestry resource for building material (e.g., posts, lintels, corral walls), fuel (e.g., firewood, charcoal), manufacture of craft objects (e.g., figurines, spoons, wooden cups), weapons, agricultural tools, and musical instruments, as many archaeological features and artifacts found on recent investigations demonstrate (see Gisbert *et al.* 1996, Michel 1996, 2000; Sagárnaga 1997). It also was used as a dye, and as a medicinal and forage plant (Gisbert *et al.* 1987).

Concerning the indirect forms of use that the Carangas made of the *Polylepsis*, it seems probable that they saw the woodlands as important hunting and gathering places. *Polylepsis* and *Buddleja* trees were probably planted to give shade in the vicinity of household structures, as they are still used today. The trees also could serve as windbreaks lessening the strong puna winds, for water runoff regulation, and for erosion control on the hillsides (*P. tarapacana* germinates on naked soil, where the risk of erosion is higher [Lieberman 1986]). Its root mat was probably used for soil protection and nutritional retention (see Fjeldså & Kessler 1996). Forests of *Polylepsis* could also have played an important role in climate regulation and microclimate recreation (see Lieberman 1986, Fjeldså & Kessler 1996). Nevertheless, although most of the indirect uses might seem evident, more fieldwork is need to determine their prehispanic occurrence.

Certainly, one of the most useful economic uses that *Polylepsis* had was its incorporation into agroforestry and agrosilvopastoral systems, where its indirect and direct uses probably multiplied. This type of system also allowed the management of natural resources in the long term and possibly in a sustainable way (Fjeldså & Kessler 1996), as apparently in the Carangas region until the Spanish conquest. Moreover, considering the cooperative nature of the Carangas' social organization it is highly probable that the use and management of the *Polylepsis* woodlands was a communal responsibility (see DDA *et al.* 1993).

*The symbolic importance of the keñua.* We have been able to verify the utilization of keñua in the Carangas' religious architecture, mainly in funeral towers (*chullpares*). They were made of sun-dried mud bricks and/or stones, and with keñua trunks and branches disposed as beams and in many cases as lintels (Gisbert *et al.* 1996, Michel 2000). In the Andean highlands, the *chullpares* constituted the most important type of ceremonial architecture (Pärssinen 1993, Gis-

bert *et al.* 1996, Sagárnaga 1997). There are a variety of funeral towers in the Carangas territory, and some of them were decorated with complex geometrical designs in several colors that recall the showy Andean textiles, principally those of Inca origin (Gisbert *et al.* 1996).

Above the lintel of most of the funeral towers located in the Carangas territory, a number of circular holes are present, inside which wooden libation cups were placed. These wooden cups, called *kerus* are coned shaped and were made usually of keñua wood (Gisbert *et al.* 1996). There have been many archaeological finds of *kerus* in this type of context (Pärssinen 1993, Ponce 1993, Gisbert *et al.* 1996, Sagárnaga 1997, Michel 2000). It is remarkable that at the present time in some regions of the Department of Oruro (former Carangas territory), the keñua trees are known by the same name of *keru* (Anze & Huanca 1993). On the other hand, there are numerous polychrome *kerus* of Inca origin manufactured in colonial times (Posnansky 1957, Rowe 1981, Flores *et al.* 1998), decorated with a complex iconography associated with the resistance and the continuity of the Inca religion (Flores 1990, Capriles & Flores 1999, Gisbert 1999). Finally, in Pacajes, Quillacas, and other ethnic group territories, some wooden *kerus* have also been reported (e.g., Pärssinen 1993, Ponce 1993).

The importance of these wooden cups or *kerus* in funeral rites has been underlined by several researchers (Rowe 1981, Ponce 1993, Abercrombie 1998, Gisbert 1999). The findings of *kerus* above and inside *chullpares* lintels are associated with rituals and ceremonies dedicated to the dead, though it has been suggested that they also played an important role in mediation with the spirits of the other world (Abercrombie 1998). Apparently, these cups were used to drink *chicha* (beverage of fermented corn), in particular ceremonies and feasts were both, dead and alive participated (Liebscher 1986, Gisbert 1999). According to Isbell (1995, see also Abercrombie 1998), the *ayllu* (which was the basic Andean social organization institution) was based on the presence of a mummified ancestor preserved and worshipped by its descendants in an open sepulcher, so that he continued to participate in the political and ritual life of the community. Therefore a strong interrelationship between the living and the dead existed. In this interaction, the *kerus* were decisive elements of mediation, and, considering the Andean principle of *yanantin* (the dual division given to things, the *kerus* were made and used in pairs [*cf.* Liebscher 1986, Flores

1990]). If we consider that no wooden *kerus* have been found in domestic contexts (Gisbert *et al.* 1996, Michel 2000), and that the Carangas houses were principally made of stone and adobe (Michel 2000), then the presence of *kerus* in the holes above the lintels (made of keñua wood) and inside of the *chullpares* suggest that apparently there was a dividing line between the sacred space inside the funeral towers and the profane space outside them, drawn by the keñua wood.

If we analyze the style of the ornamental elements that compose the material culture of the Carangas, we will find new indicators of the meaning in the use of keñua in everyday life. According to the ceramic typology of the Carangas as defined by Michel (2000), their bowls are the most representative vessel form. Their decoration presents a smooth and careful finish, generally with designs painted in black over the oxidized orange surface of the paste, and usually over the external surface of the lip or on the interior surface of the vessel. The most recurrent designs drawn on the internal surface of this pottery show lineal compositions of stairways, simple horizontal lines accompanied by wavy lines and circles, and tree-like branches (Michel 2000). The botanical designs are not only observed inside bowls, but are also present in cups, jars, and pots. Therefore it seems reasonable that phytomorphic iconography played a substantial role in the Carangas' material culture.

*The social importance of the keñua.* According to the above exposition, the importance given to the keñua by the Carangas could have originated for three main reasons. Firstly, *Polylepis* woodlands allowed them to multiply their scarce natural resources, especially through the indirect and communal uses of the plant. Secondly, it allowed them to benefit from a great number of uses that were employed mainly in ceremonial ways. And thirdly, we believe in the possibility of an accentuation of "Carangas" identity through the self-identification of this group with its natural environment, where the keñua had a predominant role. Hastorf (1998) has underlined the importance of economically useful plants in the generation and development of ethnic identities in the Andes as well as in other regions, generated through a self-conscious identification process. Moreover, Hastorf & Johannessen (1991) have stated that "wood and trees in the Andes are much more than fuel; they also have social, symbolic, and political dimensions." The Carangas, through a long process of cultural continuity, pro-

gressively involved the keñua within their main imaginary patterns and ethnic identity, allowing a sustainable use of this species.

*The Incas and the sustainable use of the keñua.* The Carangas also interacted with the Incas during the Late Horizon when they allied with the Inca empire and participated in the social organization of the *Tawantinsuyu* (Riviere 1983; Gisbert *et al.* 1987, 1996; Michel 2000). The Carangas shared many cultural attributes with the Incas, among them the management of the *Polylepis* forests. Furthermore, it is remarkable that the Incas reforested many areas in several regions inside and outside the Cuzco region, especially with the species *Polylepis racemosa* (Kessler & Driesch 1993). They also had a functionary in charge of the planting and breeding of trees, under the title of *Mallki camayoc*, which simultaneously means planted tree and deceased ancestor (Herrera 1923, Sherbondy 1986, Johannessen & Hastorf 1990, Kessler & Driesch 1993). Showing its economic and symbolic importance, many of the man-made *Polylepis* forests planted by the Incas had multiple direct and indirect uses.

In the Inca temples and palaces the use of the keñua was very common, as much for its quality as wood (Agurto 1988) as for its availability (Escalante 1993), symbolism, and social meaning. Agurto (1988) affirms that beams made from *Polylepis* wood were often used in the construction of the *kallankas* roofs (the commonest large type of Inca ceremonial structure) due to its high density. Additionally, for building the Quriqancha and Sacssahuaman gigantic stone constructions in Cuzco, thousands of trunks were required to transport the rocks from the quarries and to reach their exact positions at the walls. The Incas also built beautiful gardens, such as those located in Yucay in the Urubamba valley, or Kusijata in the Copacabana Peninsula, where *Polylepis* species were also represented. The Incas were very skilled at integrating architecture with the landscape. In Kopakati, located close to Copacabana, the remains of an ancient Inca road was ornamented with arrays of *Polylepis* on both sides. Also in the Island of the Sun, *Polylepis* trees are frequently associated with constructions of Inca origin, often over terraces.

The *Polylepis* woodlands were also sources of raw material for the looms used to weave the vicuña wool textiles, which were utilized in ceremonies and rituals by the priests and Inca noblemen. They also ob-

tained dye from the keñua bark. Moreover, the Incas handcrafted keñua wood to make *kerus*, musical instruments, figurines, scepters, and weapon handles, among other artifacts, most of which were destined for the use of the empire's elite.

## CONCLUSIONS

There are many indicators linking the Carangas and the Incas with the keñua and its meaning. We believe that the management of the keñua took place in regions like the Carangas territory before the Inca conquest. This resource management process was progressive; it arose from gathering, foraging, and hunting practices, developed during the Archaic Period, but after several centuries became a long-term management of the landscape.

One of the key ideas of this management was the equilibrium or balance generated between the Andean culture and its environment (see DDA *et al.* 1993). If this equilibrium is broken by cultural factors, then the extraction of the resource will become unsustainable, and this clearly happened in the Andean highlands after the Spanish conquest. The widespread cult of *Pachamama*, or mother earth, another pillar of the Andean social organization (Claros 1994), generated an attachment to the environment and the organisms that inhabit it, and included the protection of the *Polylepis* forests. The anthropomorphic value of the landscape (Gisbert *et al.* 1996) was one of the most important strategies for natural and communal resource management in the Andean highlands. Considering the mountains and hills as living superiors beings, it committed the inhabitants of the region to requesting permission to use certain resources and not to abuse them (Urton 1985), setting down the basis for what was a sustainable management of these resources.

Andean societies like the Incas and Carangas developed very sophisticated ways of forest management, within the same principles of respect for nature (e.g., Hastorf & Johannessen 1991). The reforestation was the exclusive task of an imperial employee who planted and nurtured the trees, but a complex system of regulation for resource extraction was also implemented (Johannessen & Hastorf 1990). The Andean man through his cosmic vision sees nature as his mother, constantly giving life (Urton 1985, Claros 1994, Claverías 2000). This vision has generated subsistence strategies and surplus economies by means of the use of appropriate technology, generated from direct ob-

servation of and interaction with the natural environment and attempting a sustainable management and use of the natural resources (Erickson 1999).

We believe that the effectiveness and success of the management in a "sustainable" way of the highland *Polylepis* woodlands was accomplished mainly through the inclusion of the keñua tree at the center of the identity of groups like the Carangas and the Incas, through both economic and symbolic importance. It still remains necessary to further explore some concepts, to contrast some ideas, and to verify many hypotheses presented in this article by means of contextual and interdisciplinary investigations in the fields of archaeology, anthropology, ethnohistory, and paleoethnobotany.

Finally, we would like to alert readers to the importance of understanding both ancient forest management and the current practice (DDA *et al.* 1993, AGRUCO, PROBONA 1999), not only regarding the keñua but also other highland Andean species like the kiswara (*Buddleja* spp.), the Andean pine (*Podocarpus parlatorei*), and the Andean alder (*Alnus acuminata*), with the purpose of outlining policies for conservation that are not opposed to certain principles and native beliefs (DDA 1993). On the contrary, an attempt should be made to recover such uses and management, and to incorporate them in a systematic manner in the practices of rural development (Fjelds  & Kessler 1996). This would benefit the indigenous populations that have used this natural resource for more than two millennia as well as the conservation of the Andean biodiversity.

## ACKNOWLEDGMENTS

This study benefited from the insightful comments of many peoples of whom we would like to thank Juan Albarracin-Jordan, Dante Angelo, Carlos A. Baied, Carlos Capriles, Alejandra Domic, Christine A. Hastorf, Pilar Lima, Marcos R. Michel, Eduardo Pareja, and three anonymous reviewers for their useful advice.

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