

Promoting the diversity of worldviews: An ontological approach to bio-cultural diversity

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Introduction

Since the 1990s, bio-cultural diversity has emerged as a new field in both academia and policy-making as a response to the growing concern over the 'converging extinction crisis' – to employ the words of David Harmon (1996) – that is affecting both biological and cultural diversity. The concept of bio-cultural diversity is based on the recognition of the existence of what the Declaration of Belem calls an 'inextricable link' between biological and cultural diversity, many of the areas of highest biodiversity on earth being inhabited by indigenous or traditional people (Posey, 1988; 1999). The empirical demonstration of this intimate link has been mostly made thanks to ethnolinguistic studies that, by taking language as the proxy for cultural diversity, have highlighted the high levels of correlation that exist between the geographical distribution of linguistic groups and biological species at the global and to a lesser extent at regional levels (Harmon, 1996; Oviedo et al, 2000; Stepp et al, 2004).¹

The range of hypotheses that have been put forward to explain the correlation between biological and cultural diversity goes from purely natural deterministic positions, such as 'high levels of biodiversity allow for the isolation of cultural groups and thus for higher levels of linguistic and cultural diversity' (Collard and Foley, 2002; Mace and Pagel, 1995; Nettle, 1996), to cultural-symbolic ones, such 'indigenous and traditional people maintain high level of biodiversity based on their cosmovisions and knowledge systems' (Haverkort et al 2003; Posey, 1999). These divergent positions are not exclusive to the field of bio-cultural diversity, but rather reflect the long-standing intellectual debate within natural and social sciences over human–environment relationships. Nevertheless, many researchers of the field, including us, agree that both biodiversity and the way humans conceptualize, understand and act upon their natural environment are the product of specific historical processes of co-evolution between nature and society (Norgaard, 1995).

In this chapter, for the case of a Bolivian community, we show some of the limitations of the dominant ethnolinguistic approaches to explain the correlations between cultural and biological diversity, namely in the role that local cultures can play to maintain and enhance biodiversity. Without questioning the ethical imperative of conserving the world languages as part of the diversity of life, along with the cultural

¹ For a comprehensive review of the historical antecedents, ethical underpinnings, and the key literature of the field of bio-cultural diversity, see Maffi (2005).

and biological diversity, we propose a shift to an ontological approach for a more comprehensive understanding of the links between these different kinds of diversities.

Taking the example of Bolivia, we first demonstrate that the correlation between biological and ethnolinguistic diversity may differ depending on the scale (global, national, ecoregion). We then show, based on a case study of the Bolivian Andes, that different forms of perceiving, valuating and giving a meaning to the need to conserve biodiversity are generally related to certain specific sets of basic assumptions on 'how nature is' and on 'how we understand it'. We therefore suggest considering 'ontological communities', rather than ethnolinguistic groups, as a more comprehensive proxy for cultural diversity that may help us understand how a specific social group relates to and manages biodiversity.

The distribution of bio-cultural diversity in Bolivia

In the map of Bolivia (see Figure 1), we have superposed the distribution of vertebrate and vascular plant diversity and the distribution of ethnolinguistic groups. In the classification of bio-cultural diversity index, according to Loh and Harmon (2005), Bolivia ranks quite high with position 26 and a bio-cultural diversity index of 0.608. It is undeniably accurate that, like the other Andean countries, Bolivia presents both high levels of biodiversity (with 12 ecoregions, over 20,000 vascular plants species and over 2,800 vertebrate species) and a high number of ethnic and linguistic groups (around 40 ethnolinguistic groups). We can nevertheless see from our map that although biological and linguistic diversity distribution may correlate well at the global scale, the same is not true at scale of Bolivia, where biodiversity is highest in the low populated eastern slope of the Andes – the Yungas region – while linguistic diversity is most important in the Northeastern lowlands – the Chaco and Amazon regions.

In order to understand the current distribution of biological and cultural diversity in Bolivia, there is a need to take into account the natural, historical, cultural and socio-political factors that affect these kinds of diversities and shape the relationship between them. For instance, as we look into the social processes that affect the current state and distribution of biological and cultural diversity in Bolivia, we cannot overlook the cultural dynamics at hand (that is, processes of expansion of the market economy, hegemony of the western-based education system, national and international migrations, cultural pluralization and so on) and the power relationships that exist among the diverse social groups over access to and management of natural resources (that is, development of large agro-industries in the lowlands, creation of protected areas and such like).

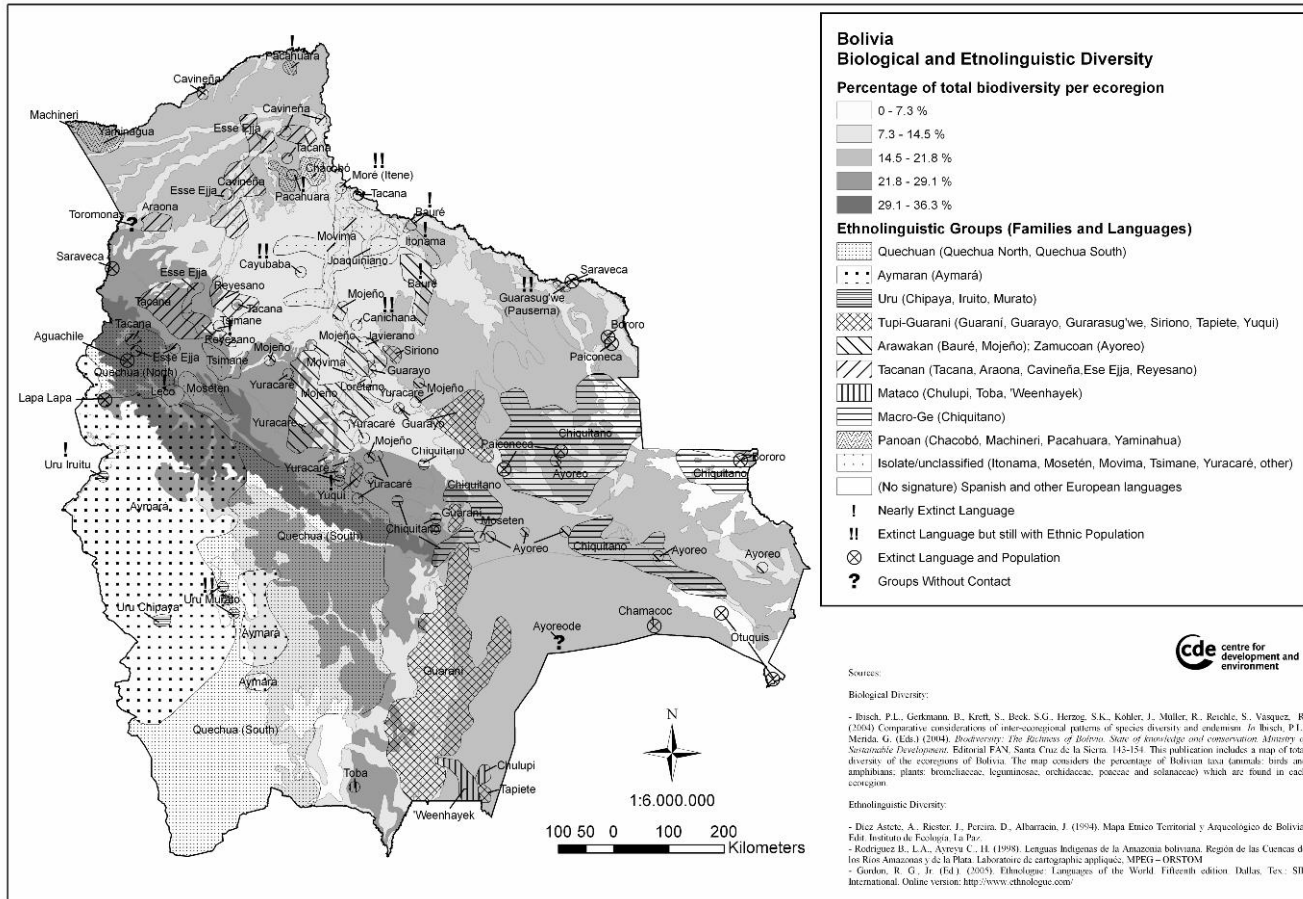


Figure 1 Map of Bolivia

A framework for understanding nature–society relationships

Humans' actions towards the 'natural world' are an expression of culturally constructed nature–society relationships that result from a set of symbolic representations, value systems, tacit and explicit forms of knowledge and practice. The relationships between a specific human society and its natural environment are mediated by various interrelated facets of culture, namely by that society's members *ontology* (namely, the conception of being, what exists, what and how is the natural, spiritual and human world), *epistemology* (namely, the conception of knowing, what is knowledge, what and how we know about nature, society and spirits), *normative orientations* (namely, the rules that guide our actions, the conception of what is good or bad, what is the value of nature, humans and the spiritual world), and *practices* (namely, the activities of everyday life, what we do, how we use nature, relate to people and to the spiritual entities).

All these cultural aspects together form a framework of interpretation and interaction with the natural world that we call a 'worldview'. There is a great multiplicity of worldviews not only among, but also within, the globe's cultural groups. Environmental anthropologists have shown that there are different ways to conceptualize and understand nature and that these conceptualizations are the dynamic products of historical and cultural contexts (Descola and Gíslí, 1996; Ellen and Fukui, 1996; Posey, 1999).

Coming back to concept of bio-cultural diversity and the use of language as a proxy for cultural diversity, linguists working in the field argue that the environmental knowledge and practices of indigenous people are, to a significant extent, 'developed, encoded and transmitted through knowledge' (Maffi, 2005) and that 'languages as repositories of cultural memory and guides to action can influence the landscape and its biodiversity' (Wollock, 2001 paraphrased by Maffi, 2005). These assertions might be true to a certain extent, but conversely, findings in anthropology show that much practical knowledge is in fact non-linguistic and that language plays a small role in the transmission of knowledge. According to Bloch, 'we should see linguistic phenomena as a part of culture, most of which is non-linguistic' (Bloch, 2001). We feel that it is overly simplistic to reduce all the facets of culture that mediate the relationships between nature and society (that is, ontology, epistemology, normative orientations and practice) to language, and therefore stress the importance of taking into account ontological aspects to understand nature–society relationships. In this 'ontological approach', ontology has to be understood as linked with epistemic, normative and practical aspects, and not as an off-context, purely theoretical consideration. Rather than ethnolinguistic groups, we suggest therefore to identify and consider ontological communities (that is, constituted by those that share roughly the same basic assumptions about what does exist and how the natural, human and spiritual worlds are), when aiming to understand the links between biological and cultural diversity.

Defining an ontological community in the Bolivian Andes

To illustrate the relationship between the ontology shared by indigenous people and their surrounding biological diversity, the rural community of Chorojo, located 60 km away from the city of Cochabamba, was taken as a case study. The community has about 60 families who share a territory of approximately 16 square km. Until the Bolivian Agrarian Reform (1952), the land was owned by a landlord who kept the local population in serfdom until 1952. Agrarian reform resulted in the redistribution of the land to the peasants, who were organized in syndicates, that, by introducing elements of traditional governance, formed what local people consider now to be 'our community' (Serrano et al, 2006). The territory of the community ranges from 3,400–4,600 m above sea level and shows a high diversity of climates and ecosystems. The Chorojo people are Quechua speakers, many monolinguals and some bilinguals with Spanish. They practice mainly a subsistence agriculture centered on potato production and complemented by the production of other Andean tubers, cereals and maize, and sheep and cattle herding.

Contrary to western scientific worldview, Andean ontology does not see the human as an independent subject opposed to an objective world and does not oppose a human world governed by social laws (the 'rules of mind') to a natural world governed by physical and biological laws (the 'rules of matter'). For the Andean people, mind and matter do not belong to separate realms and can be related directly, making possible direct relations between spiritual activity and social and material phenomena. Further to the fact that every being is related to each other, these relations are the basic condition for the existence of any entity (Estermann, 1998). This is also true for the existence of the human individual who cannot be conceived unless it is related to nature and to its community, but also to spiritual entities. To survive, humans can and must build spiritual relations with all entities, where social and material life is perceived as a kind of 'materialization' of spiritual phenomena, not necessarily based on causality (Rist and Dahdouh-Guebas, 2006). In this context, contrary to the natural science-based materialism that can be interpreted as a 'monism of matter', the Andean position rather represents a 'monism of mind' (Rist and Dahdouh-Guebas, 2006).

For example, looking at a plant or counting animals can directly influence their health and growth. Explicitly elaborated ontological concepts are, indeed, only partly perceived by the members of the community (Rist and Dahdouh-Guebas, 2006). Usually, they are rather expressed in action-guiding values, norms, practices, customs, rituals, beliefs and in the discourse of community members about their daily life.

Andean ontology also does not distinguish between alive and inert beings or between those able of reasoning or not. Every being is considered to be alive and able to feel, to think and to reproduce. The stones 'breathe like humans', the trees 'talk', and so on. In this context, the landscape is turned to into a 'community of living beings' where human categories are 'naturalized' and the environment and the universe is 'humanized' (Serrano et al, 2006).

Other fundamental ontological principles are related to polarity and complementarity, which means that every entity and action has a complementary element with which it forms an integral whole. This means that there are no absolute opposites but only relative ones. No entity exists by itself, but only because it is related with its complementary element. This principle is expressed by the term of *Pacha*, which means literally 'the two fundamental forces' that are part of every being and allow its existence. Because everything is alive, these forces are conceived of as the 'male' and 'female' sides of every being and imply a gendered perception of the landscape.² In the community, rivers, mountains, rocks, lagoons or plants are conceived as being male or female. Places with both male and female representation are at the top of the spiritual landscape hierarchy, like the Tunari Mountain that is said to be *Chacha-Warmi* (male and female) (Serrano et al, 2006).

The principle of *reciprocity* is linked to the principle of complementarity and explains the nature of the relationships between spiritual, social and natural entities in terms of actions. Every action (of humans, animals and other beings) takes into account the polarity of the identities involved and thus will express a flux in both directions (Estermann, 1998). In the community, sowing and harvesting is always accompanied by the rituals of *q'owa* (giving to eat) and *ch'alla* (giving to drink), aiming at feeding the spiritual beings, as expressed in the following quote by 39-year old villager, Encarno Mayrana:

We have to name every peak and hill and propitiate them the rituals of '*ch'alla*' and '*q'owa*' if we want to sow potatoes and other tubers. We name also the big stones, the Aqorani hill and the Tunari Peak who is called San Martin, these are important mountains for propitiating, we name them and so we have learned from our grandfathers.

But the most respected entity with whom humans can relate is nature itself, represented as *Pachamama*, which literally means 'earth's mother' (Rist, 2002). A positive relation with *Pachamama* is fundamental to ensure production as well as family and community well-being. Because reciprocity rules are effective in every aspect of life, the reciprocity with *Pachamama*, as expressed in corresponding rituals, is of great importance in the community. According to Urbana Mayrana (16 years old), '*Pachamama* cares for land. When land does not want to produce it is because she got tired. Sometimes, although we put manure land does not produce'.

Other important ontological elements are the notions of and the relations between time and space. Time and space are not conceived of as separated, but form an organic unit: the *Pacha*. In the territory of Chorojo, this is expressed by in the legends attached to specific places; they tell of how these places were built or owned by spiritual communities belonging to specific times like *Ch'ullpas* (mythical 'little' humans that lived before the Incas), Incas, Catholic Saints, and *Aukis* (direct ancestors who may appear to people as spirits). High mountains are called *Auki Cabildos*, which literally means 'Council of Ancestors'. Furthermore, native trees are believed to have been planted by the Incas. These spirit-inhabited places generally coincide with low current human occupation and land use. As an expression of the absence of

² The theme of the 'gendered dimension of the landscape' is the subject of a former publication (Serrano et al, 2006).

distinction between the human and the natural world, 'natural' or 'near-natural' places are conceived as opposite to human settlements in a time–space cyclical scale that is subject to dynamic change.

Epistemology in an Andean community: A way to read nature and the landscape

In Chorojo, the influence of the principles of Andean ontology is clearly visible in the interpretation of natural events as well as in the landscape characterization by the members of the community. The Andean ontology is thus sustaining what could be called an Andean epistemology.

Natural events are understood as the expression of *Pachamama's* response to human behaviour. This vision is shared by the Chorojo people, for example, when they perform rituals for calling rain, as stated by the testimony of Marcial Romero (31 years old):

Sometimes there is no rain. One year from November to January there was no rain... so people went to this place of Mazo [a lake]. It is called Mazo Qhocha, it is found beneath the Peak of Ch'ullpa K'asa. So people went there, they brought back some water and spread it into the river, and it began to rain.

Based on this view, 'signs from the *Pachamama*' are interpreted to predict natural events. Zoological, botanical, mineral, atmospherically and astronomical indicators are used by community members to predict important factors such as rain or freeze amount, and plan their productive activities accordingly (Ponce, 2003).

During a discussion group, the Chorojo inhabitants could mention over 200 place names or toponyms within their territory where they locate their daily activities. Toponyms are not defined through a pre-existing classification, but through place characteristics in a holistic view that includes topography, vegetation, fauna and historical, social and spiritual aspects. The idea that everything is alive is also applied to these place names, which are not perceived as pure human abstraction, but as real existing beings who often 'reveal their names' to humans in dreams and in meditation. Places can also have 'secret names' in addition to their common name that are often names of persons whose titles indicate their place in the spiritual hierarchy. For instance, this applies to high peaks, such as the Tunari (5,035 m), also called San Martín, and the Aqorani (4,606 m), also called Don Mariano. As explained by 65-year old community member, Prudencio Mejía:

Every place has its name. That part you see [showing the Aqorani peak] is called Don Mariano this is his name, others are for example Condor Samana [Condor's resting place] and each one has name and surname, and has its history and legend.

In this view, people can also enter in communication with 'places' and build spiritual relations with them throughout the community's territory. In Chorojo, this is clearly illustrated by the prayers that are pronounced during rituals, where a list of place names are enumerated and 'invited' to participate to the ceremony. Before harvesting a field of *papa lisa* (*Ullcus sp.*) and taking the product to the local market,

community member Donato Ramos (about 60 years old) propitiated some alcohol and coca leaves with the following words:

Let us propitiate a *ch'alla* ritual to the Holy Earth, in the same way we propitiate the *ch'alla* to the Holy Virgin Land of 'Q'ellu K'asa',* of 'Jarani',* also the same for 'Juch'uy K'asa',* and now we give the *ch'alla* to the Holy Virgin Land of 'Misuq'uni'.* May things go well, may our harvest call for good luck when we bring it to the market... We also brought some coca leaves... So today we will harvest the product and tomorrow we will bring it to the market, may it be in a good time, 'Llust'a Orqo'* is our Holy Land to give the *ch'alla*, because it made us produce, so we identify us with him. So all this. Thank You

*Place names from the community's territory

Normative orientations and resources repartition in an Andean community

The ontological and epistemic principles described above have a strong influence on the normative orientations that are in force in Andean communities. In Chorojo, local norms are not formal and are based on customary behaviour and ethical principles, for which nature is a constant source of inspiration. Because everything is interrelated, humans also have to relate to each other according to the principles of complementarity and reciprocity in the context of the family and the community.

Powerful entities such as the *Pachamama* also perceive the attitude of humans, which have to establish relationships based on reciprocity and complementarity between the members of the community, thus bringing a sacred dimension to social relations. The basic unit of polarity and complementarity is formed by the couple that forms a family. In Chorojo, marriage is sacred and a person is only really considered as an adult with the right of vote and of eligibility within the communal organization once he/she is married. Divorce is not allowed and infidelity is severely punished (Serrano et al, 2006). The organization of the community is based on the agrarian syndicate, which is complemented by a traditional organization with pre-colonial features, forming a unique dual organization system (Serrano, 2001). Authorities of the village organization are concretized in the revolving exercise of 8–12 different functions that are assumed by every family of the community. After its conformation by marriage, every family is charged along its biography with increasing responsibilities, until husband and wife assume together one of the maximal authorities. Maximal authorities are the *dirigente* for the syndicate, who represents the interests of the community in external organizations, and the *alcalde de campo* for the traditional organization, who is in charge of maintaining harmonious relations within the community. Both are elected for one year by the community.

The repartition of the access to natural resources within the community reflects the principle of redistribution (Serrano, 2004), which is linked to the principles of reciprocity and complementarity in the sense that a unilateral accumulation of a resource could endanger the relational equilibrium in the community. In Chorojo, as in most parts of the Andes, including the urban areas, people with more economic resources are asked to finance events as *pasantes* (celebration godfathers); moreover,

corrupted politicians and very rich people are said to be more vulnerable to accidents and tragic events because '*Pachamama* is collecting payment'.³

In Chorojo, all land belongs to the community that possesses a single common property title in the name of the syndicate. Land repartition within the community expresses itself in a combination of familiar and communal access to land. Family lands are located near houses and in the lower part of Chorojo's territory (3,400–3,700 m) and are mainly irrigated croplands. In these areas, a permanent access and use right is recognized by the syndicate to the descendants of the peasants who got the land from the former landlord after the Agrarian Reform of 1952. However, this cannot be considered as private property right in the European sense of *jus utendi et abutendi* because families are not allowed to sell their land outside the community. Community members who migrate permanently and do not contribute any more to the communal organization may lose their access to land. Communal lands are mainly pasture lands, and also agricultural lands in the highest part of territory (3,700–4,100 m). Communal agricultural land is divided into about 15 sectors called *aynoqas*. Each year, one of the *aynoqas* is sown with potatoes and then with oats during the two next years, so that there are always three *aynoqas* that are cultivated, while the rest function as grazing lands. Within the *aynoqa*, crop plots are distributed to the families according to their size and needs, thus ensuring land access to everyone in the community.

Another ethical principle in force in the community linked with the principle of reciprocity and universal relation is the respect (Serrano, 2004). Because every action has to be 'balanced' by a reciprocity act, no unnecessary actions with negative impacts to other entities shall be performed. Animals and plants should not be killed unless this is done for eating or using them. In the same sense and coupled with the principle of redistribution, no abusive or mercantilist exploitation of resources can be done in the community, but only those aimed at one's own sustenance. As reciprocity actions, rituals have to be performed before opening a field, cutting a tree or killing an animal. It is important to underline that the principle of respect is not based on an intrinsic 'right to exist' of all life forms, but rather on the principle of reciprocity: if I harm an animal, I will be harmed back with disease; if the animal harms me, I will be paid back by some lucky event, as illustrated by the following quote from Donato Mérida, a 55-year old member of the neighboring community of Tirani:

The condor uses to fly in the highlands, and sometimes he eats the brood of our sheep or of our llamas. But after that he does his prayer, it is not about just eating like that! So if he caught one you can't take it back, you are not the owner any more. So we just let him do, so our livestock can reproduce better, because it brings luck. The condor says his prayer before he eats, and so your livestock procreates better!

³ 'La *Pachamama* se cobra' in Spanish.

Land use system and biodiversity of an Andean community

In the community, the ontological, epistemic and normative foundations converge into the practice of the land use system, which is also ruled by a set of principles. The territory of the community is divided into production zones, which are defined by the association of specific complementary polarities that characterize different portions of the territory: high/low, cold/warm, dry/wet, male/female, and where specific land use practices are allowed. The highest part of the territory (between 4,100 and 4,600 m), located above the agriculture limit, is called *Pata Loma* and is grazed during the rainy season. The lands between 3,800 and 4,100 m are called *Loma* and are ruled by the *Aynoga* communal system, which alternates agriculture and grazing. The lands between 3,600 and 3,900 m are called *Chawpi Loma* and are familial lands with rain-fed crops and grazing. Within this stage, special zones are further distinguished: the *Monte* area with the presence of native forests dominated by the tree *Polylepis besseri*, and the *Chimpa* area with a southern exposition, believed to be drier than the northern exposition area where the forest is located. The lowest part of the territory with irrigated familiar croplands is called *Ura Rancho*.

The livestock of Chorojo is divided in the higher or *Puna* herds (llama and sheep) and the lower or *Valle* herds (sheep and goats), that follow different altitudinal gradients according to pasture availability along the year and to the necessity of protecting the crops from the livestock (Rodríguez, 1994). In the production zone where the livestock is kept, grazing activity is led by the women in a rotational way so that practically all land is under grazing influence, especially the stony and steep soils that are not arable. During the rainy season from November to February, the *Pata Loma* zone is grazed by the higher herds and the *Aynogas* zone is grazed by the lower herds. Between March and June, the higher herds graze the *Aynogas* and lower herds go down to the *Chawpi* zone. Starting from July, all herds graze harvest rests (*rastrojos*) in the *Chawpi* and *Ura Rancho* zones and then go into the forest until October. Because higher herds are larger, grazing is more intensive in the highest parts of the community (Rodríguez, 1994).

Because of the communal norms explained above, direct use of local biodiversity by individual families is limited to self-consumption. The native forest is an important source of medicinal and diet complement plants (Hensen, 1992). Small wild animals like *viscacha* (*Lagidium viscacia*) or wild guinea pigs (*Cavia sp.*) are occasionally hunted. Commercial extractive activities, such as charcoal production from the native forest, are usually prohibited, because they are seen as a danger to the natural, social and spiritual equilibrium of the community.

As a consequence of the land use system in Chorojo, there is practically no place without human activity in the territory of the community: all non-arable lands as well as fallow lands are grazing lands, and all arable lands are cultivated periodically, except if they are covered by trees. But the diversity of uses also results in a great variation in the intensity of use. In this context, one can talk about a continuum in the application of the time–space perception: the more intensively the land is used, the more directly it is linked to the humans and their daily life. The more extensively it is used, the more it is associated with the spiritual and ancestors world.

The biodiversity of Chorojo was assessed by a phytosociological survey realized by Boillat (2007) with the support of the Centre for Biodiversity and Genetics of Cochabamba University (Antezana et al, 2006). A total of 22 vegetation types were identified, which represent landscape elements or 'local ecosystems' (Forman, 1995) taken as a proxy for ecosystem diversity. These vegetal communities differ in structure and species composition and are mainly the result of the succession and regression processes linked to fallow practices and different grazing intensities (Boillat, 2004). They can be grouped into the following structural groups: native forests, open and closed scrublands, tussock-grass tall grasslands, open short grasslands, closed short grasslands, forbs communities, humid grasslands and tree plantations.

The vegetation types were analysed according to their association with land use practices, and their distribution within the production zones of Chorojo. Ten vegetation types including forbs, shrubs, grasslands and forests are associated with grazed fallow lands and are therefore influenced by both agriculture and grazing. Six types are associated with non-arable grazing lands and one is a plantation of exotic tree species. Only five types are influenced primarily by natural factors (wetlands and rocks) and would probably remain similar if agriculture and grazing would stop, although wetlands are somewhat enhanced by traditional irrigation practices. Moreover, 13 of 22 vegetation types occur mainly in one specific production zone. In the *Pata Lama* zone, three different communities appear due to different effects of grazing according to the topography. The *Aynoqas* zone has four specific vegetation types linked to grazed fallow lands. There, agriculture is extensive but covers almost the whole area because of the relatively flat topography. In the *Chawpi* zone, however, topography is very uneven and has steep and rocky slopes where agriculture cannot be practiced, thus shaping a mosaic of croplands, fallow lands and non-arable grazing lands. The *Monte* area is characterized by the native forest of *Polylepis besseri* that has a historical distribution and is protected by specific local norms. In general, forbs communities as well as succession shrubs (*Baccharis dracunculifolia*) and grassland communities are strongly linked to the different fallow durations that are practiced in each production zone.

These observations show that most vegetation types are directly linked to traditional practices like agriculture and grazing, and also that an important part of the vegetation types is related to a specific land use practice in a production zone. The diversity of vegetation types in the area is strongly influenced by the diversified local practices that build on the community's worldview, but also by some local natural conditions that influence the diversity and intensity of use. Therefore, the actual diversity of vegetation types can be interpreted as the result of the interplay between human, natural and historical factors that includes the Andean perception of time and nature–society relationship.

Although 'local ecosystem' diversity represented by the vegetation types is clearly enhanced by the land use system of Chorojo, this may not be always the case for species diversity. Some overgrazed scrubland types have low species diversity, as well as forbs and grasslands that are dominated by neophyte species of European and African origin (ex. *Pennisetum clandestinum*). But native forests, tussock-grass communities and other grassland types all have high species diversity.

There are also degradation processes that can be observed in the community's ecosystems, especially soil erosion that is enhanced by overgrazing on steep slopes. Some known 'cultural landscape' elements like various tussock-grass communities (Kessler, 2006) also have almost disappeared and have been replaced by short grassland or low shrubs.

In conclusion, the diversity of vegetation types in the community is high and allows the presumption of high ecosystem diversity. Diversity is greatly influenced by the specific shape of ontological, epistemic, normative and practical principles expressed by the members of the community. Although the main effects of the local land use system upon the diversity of vegetation types can be considered positive, other effects are also negative. Possible explanations for this observation could be that, first, the current biodiversity has been assessed with scientific categories that have other meanings in the community and therefore the 'conservation of biodiversity' criteria also differ, and second, the set of principles expressed by the community are an ideal that cannot be always realized because of various external factors (such as market economy and migration).

The plurality of ontological communities and worldviews

With our case study of the Bolivian Andes, we attempted to exemplify and explain the complex relationships that exist between a traditional community and the biodiversity of its natural environment. In particular, we described the Andean worldview and how it influences the local management of biodiversity. However, it is important to note that this so-called Andean ontological community is more an ideal model than a homogenous and discrete reality, and should be understood as 'a dynamic process of transcultural exchange with constant re-articulations of tradition resulting in the persistence of certain cultural practices' (Cocks, 2006), to employ the concept of culture proposed by Cocks as an alternative to the one generally conveyed in the present thinking within the theory of bio-cultural diversity.

In many parts of the world, bio-cultural diversity is undergoing major changes due to natural, socio-political and cultural factors. For instance, indigenous and traditional communities are increasingly faced with multiple new socio-economic and political influences, such as the formal and mainly western-shaped education system, the globalization of economic relationships, migration, processes of secularization and the strengthening of indigenous identities. As a result of these dynamics, formerly ontological rather than homogenous linguistic groups are changing rapidly and are becoming ever more plural. Consequently, one ethnolinguistic group (for instance Quechua, Francophone or Anglophone) nowadays generally embraces several ontological communities resulting in the co-existence of different worldviews within one social group that define specific perceptions and values of biological diversity and corresponding behaviours toward it. According to Clifford (1988), 'an ambiguous multi-vocal world makes it increasingly hard to conceive of human diversity as inscribed in bounded, independent cultures'. This is especially true in Latin America, where current societies are the product of the transcultural exchange between

indigenous traditions, colonial Catholicism, and modern political and economic systems in a process of 'intercultural hybridisation' (Canclini, 1995, cited by Cocks, 2006).

Perspectives for the conservation of bio-cultural diversity

In this chapter we have shown that in order to go beyond the empirical demonstration of the correlations between cultural and biological diversities, there is a need to shift our focus from a purely linguistic perspective to take into account the key factors that are affecting and threatening them. In order to better understand the links between these kinds of diversities, we suggested the adoption of an ontological approach to the concept of bio-cultural diversity and described the facets of culture that mediate the relationships between nature and society – ontology, epistemology, normative orientations and practices – and how they are interrelated, based on a case study of the Bolivian Andes. Considering not only the language but the ontological, epistemological, normative and practical knowledge and intuitions expressed through language allows us to explain why, within homogenous linguistic groups, there is a heterogeneity of practices that sometimes have a positive and otherwise a negative impact on biological diversity.

Against this background, what are new insights for action oriented towards the conservation and enhancement of bio-cultural diversity? We identify three complementary requirements:

1. To promote a diversity of worldviews in order to maintain the diversity of frameworks of interactions with the natural world. Among others, this implies taking into account the existence and active strengthen of the various ontological communities that underlie a society's management of biodiversity.
2. To address the issue of unequal power-distribution among and within the holders of different worldviews and ensure equitable relationships between them. An emphasis has thus to be given on the active empowerment of the weakest ontological communities.
3. To foster a dialogue between the holders of the distinct worldviews. Therefore, efforts have to be oriented towards the facilitation of social learning and negotiation processes between different ontological communities, in order to reach the normative concept of sustainability in the management of biodiversity.

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References

- Antezana, C., Mercado, M. and Zarate, M. (2006) 'Reconocimiento de especies características e indicadores para la diferenciación de tipos de vegetación en el Parque Nacional Tunari', unpublished internal report, Centro de Biodiversidad y Genética – UMSS, Cochabamba.
- Bloch, M. (2001) 'Language, anthropology and cognitive science', *Man*, 26: 183–198.
- Boillat, S. (2004) 'Medio ambiente y biodiversidad desde una perspectiva transdisciplinaria – pautas para un nuevo enfoque para el Parque Nacional Tunari', in Delgado, F. and Mariscal, J. C. (eds), *Gobernabilidad Social de las Áreas Protegidas y Biodiversidad en Bolivia y Latinoamérica*, pp. 361–372, Plural Ediciones, La Paz.
- Boillat, S. (2007) 'Andean farmers' nature representation and its relationships to ecosystem diversity, case studies from the Tunari National Park', PhD Thesis, CDE-University of Berne (in preparation).
- Clifford, J. (1988) *The Predicament of Culture. Twentieth-century Ethnography, Literature and Art*, Harvard University Press, Cambridge.
- Cocks, M. (2006) 'Biocultural diversity: Moving beyond the realm of "indigenous" and "local" people', *Human Ecology*, 34(2): 185–200.
- Collard, I. F. and Foley, R. A. (2002) 'Latitudinal patterns and environmental determinants of recent human cultural diversity: Do humans follow biogeographical rules?', *Evolutionary Ecology Research*, 4: 371–383.
- Descola, P. and Gisli, P. (eds) (1996) *Nature and Society: Anthropological Perspectives*, Routledge, London.
- Diez Astete, A., Riestler, J., Pereira, D., and Albarracin, J. (1994) *Mapa Étnico Territorial y Arqueológico de Bolivia*, Edit. Instituto de Ecología, La Paz.
- Ellen, R. and Fukui, K. (eds) (1996) *Redefining Nature. Ecology, Culture and Domestication*, Berg, Oxford.
- Estermann, J. (1998) *Filosofía Andina: Estudio Intercultural de la Sabiduría Autóctona Andina*, Abya-Yala Editing, Quito.
- Forman, R. T. T. (1995) *Land Mosaics, the Ecology of Landscapes and Regions*, Cambridge University Press, Cambridge.
- Gordon, R. G., Jr. (ed.) (2005) *Ethnologue: Languages of the World*, 15th edition, SIL International, Dallas, www.ethnologue.com/
- Harmon, D. (1996) 'Losing species, losing languages: Connections between biological and linguistic diversity', *Southwest Journal of Linguistics*, 15: 89–108.
- Haverkort, B., Van't Hooft, K. and Hiemstra, W. (2003) *Ancient Roots, New Shoots: Endogenous Development in Practice*, Zed Books, London.
- Hensen, I. (1992) 'La flora de la comunidad Chorojo. Su uso, taxonomía científica y vernacular', *Serie Técnica* No. 28, AGRUCO-UMSS, Cochabamba.
- Ibisch, P. L., Gerkmann, B., Kreft, S., Beck, S. B., Herzog, S. K., Köhler, J., Müller, R., Reichle, S. and Vásquez, R. (2004) 'Comparative considerations of inter-ecoregional patterns of species diversity and endemism', in Ibisch, P. L. and Mérida, G. (eds) *Biodiversity: The Richness of Bolivia. State of Knowledge and Conservation*, pp. 143–154, Ministry of Sustainable Development, Editorial FAN, Santa Cruz de la Sierra.
- Kessler, M. (2006) 'Plant species richness and endemism of upper montane forests and timberline habitats in the Bolivian Andes', in Körner, C. and Spehn, E. (eds), *Mountain Biodiversity. A Global Assessment*, pp. 59–73, The Parthenon Publishing Group, London, New York, Washington DC.
- Loh, J. and Harmon, D. (2005) 'A global index of biocultural diversity', *Ecological Indicators*, 5(3): 231–241.
- Mace, R., and Pagel, M. (1995) 'A latitudinal gradient in the density of human languages in North America', *Proc. R. Soc. Lond. B*, 261: 117–121.

- Maffi, L. (2005) 'Linguistic, cultural, and biological diversity', *Annual Review of Anthropology*, 34: 599–617.
- Nettle, D. (1996) 'Language diversity in West Africa: An ecological approach', *Journal of Anthropological Archaeology*, 17: 354–374.
- Norgaard, R. B. (1995) 'Beyond materialism: A coevolutionary reinterpretation of the environmental crisis', *Review of Social Economy*, LIII(4): 475–492.
- Oviedo, G., Maffi, L. et al. (2000) *Indigenous and Traditional Peoples of the World and Ecoregion Conservation: An Integrated Approach to Conserving the World's Biological and Cultural Diversity*, WWF International and Terralingua, Gland.
- Ponce, D. (2003) 'Previsión del clima y recreación del conocimiento indígena en los Andes bolivianos: El caso de la comunidad de Chorojo, Prov. Quillacollo, Dep. Cochabamba', master's thesis, AGRUCO-UMSS, Cochabamba.
- Posey, D. A. (1988) *The Declaration of Belém*, First International Congress of Ethnobiology, Museu Paraense Goeldi, Belém.
- Posey, D. A. (1999) 'Introduction: Culture and nature – the inextricable link', in Posey, D. A. (ed.) *Cultural and Spiritual Values of Biodiversity*, Intermediate Technology Publications, London.
- Rist, S. (2002) 'Si estamos de buen corazón, siempre hay producción', *Serie: La Vida en las Comunidades* No. 4, AGRUCO/Plural Editores, La Paz.
- Rist, S. and Dahdouh-Guebas, F. (2006) 'Ethnoscience – A step towards the integration of scientific and indigenous forms of knowledge in the management of natural resources for the future', *Environ. Dev. Sustain.*, 8: 467–493.
- Rodríguez, B. L. A. and Ayreyu, C. H. (1998) *Lenguas Indígenas de la Amazonía boliviana. Región de las Cuencas de los Ríos Amazonas y de la Plata*, Laboratoire de cartographie appliquée, MPEG – ORSTOM.
- Rodríguez, C. (1994) 'Sistema de pastoreo en la comunidad de Chorojo, Prov. Quillacollo del Departamento de Cochabamba', graduate thesis, AGRUCO-UMSS, Cochabamba.
- Serrano, E., (2001) *Connotaciones Simbólicas de la Familia en el Ejercicio de Cargos Tradicionales*, Internal Report, AGRUCO-UMSS, Cochabamba.
- Serrano, E. (2004) 'La transformación de valores éticos en la interfaz del estado y de la sociedad civil y su importancia en el manejo de la biodiversidad, tierra y territorio. El caso del Parque Nacional Tunari', in Delgado, F. and Mariscal, J. C. (eds), *Gobernabilidad Social de las Áreas Protegidas y Biodiversidad en Bolivia y Latinoamérica*, pp. 333–359, Plural Ediciones, La Paz.
- Serrano, E., Boillat, S. and Rist, S. (2006) 'Incorporating gender in research on indigenous environmental knowledge in the Tunari National Park in the Bolivian Andes', in Premchander, S. and Müller, C. (eds) *Gender and Sustainable Development. Case Studies from NCCR North-South*, pp. 305–327, CDE, Bern.
- Stepp, J. R., Cervone, S., Castaneda H., Lasseter, A., Stocks, G. and Gichon, Y. (2004) 'Development of a GIS for global biocultural diversity', in Borrini, F. G., Maffi, L. and MacDonald, K. I. (eds) *History, Culture and Conservation*, 13 (Special issue), pp. 267–270, IUCN Commission on Environment, Economics and Social Policy (CEESP), Teheran.