

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/265090843>

# Biocultural Ethics: From Biocultural Homogenization Toward Biocultural Conservation

Chapter · January 2013

DOI: 10.1007/978-94-007-7470-4\_2

---

CITATIONS

28

READS

89

2 authors, including:



**Ricardo Rozzi**

University of North Texas

255 PUBLICATIONS 2,412 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



LTSER-Chile Network [View project](#)



Ecology & Ethics [View project](#)

All content following this page was uploaded by [Ricardo Rozzi](#) on 28 August 2014.

The user has requested enhancement of the downloaded file. All in-text references [underlined in blue](#) are added to the original document and are linked to publications on ResearchGate, letting you access and read them immediately.

## Chapter 2

# Biocultural Ethics: From Biocultural Homogenization Toward Biocultural Conservation

Ricardo Rozzi

**Abstract** The 14<sup>th</sup> Cary Conference and this book *Linking Ecology and Ethics for a Changing World: Values, Philosophy, and Action* reconnect the theoretical reason of ecological sciences with the practical reason of ethics to better understand and to more fairly assess the social processes of the changing world in which we co-inhabit today. In this chapter I invite ecologists, philosophers, and other actors to essay an additional integration: the examination of the diversity of ways of understanding the world and their interrelationships with the diversity of modes of judging which ways of co-inhabiting are just or unjust. With a biocultural perspective that highlights the planetary ecological and cultural heterogeneity, I introduce three interrelated terms: (1) *biocultural homogenization*, a major, but little perceived, global driver of losses of biological and cultural diversity that frequently entail social and environmental injustices; (2) *biocultural ethics* that considers –ontologically and axiologically– the interrelations between the habits and the habitats that shape the identity and well-being of the co-inhabitants; (3) *biocultural conservation* that seeks social and ecological well-being through the conservation of biological and cultural diversity and their interrelationships.

**Keywords** Biotic homogenization • Ecology • Education • Field environmental philosophy • Sustainability

---

R. Rozzi (✉)

Department of Philosophy and Religion Studies, University of North Texas,  
1155 Union Circle # 310920, Denton, TX 76203-0920, USA

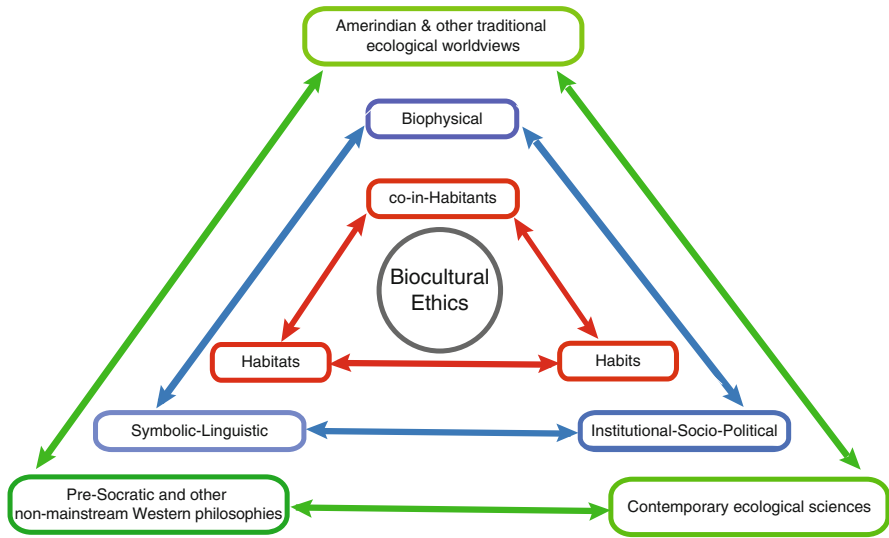
Institute of Ecology and Biodiversity, Universidad de Magallanes, Punta Arenas, Chile  
e-mail: rozzi@unt.edu

*Biocultural ethics* investigates and evaluates the ecological and social causes and consequences of both *biocultural homogenization* and *biocultural conservation*.<sup>1</sup> These three biocultural terms provide a conceptual framework and a methodological approach for conducting teamwork among ecologists, philosophers and other participants to investigate, and also to reorient, ecosocial paths of environmental change towards a sustainability of life. Biocultural ethics contributes a new eco-philosophical paradigm that transforms prevailing ethics, including environmental ethics, for at least three reasons.

- (i) In contrast to the anthropocentrism of deontological and utilitarian ethics that prevail today, the biocultural ethic connects human life with the diversity of beings, considered as co-inhabitants with whom humans co-constitute their identities and attain well-being. It is not simply an extension of utilitarian or deontological ethics to include animals, plants, and other living beings in the community of morally relevant beings, but it is an ethic that involves inter-specific relationships. Under biocultural ethics, the central philosophical question of Western ethics about how should humans inhabit is transformed into how should humans *co-inhabit* in the world.
- (ii) In contrast to the land ethic of Aldo Leopold who refers to the human species as a whole, by asserting that “a land ethics changes the role of *Homo sapiens* from conqueror of the land-community to plain member and citizen of it,” the biocultural ethic shows us that many cultures –including Amerindian, Buddhist, and some Western philosophical traditions– have ecological worldviews that recognize humans, plants, waters, and other beings as co-inhabitants. Biocultural ethics demands an inter-cultural dialogue. The global environmental change we face today is caused by particular agents (social groups, corporations, individuals), not by the species, *Homo sapiens*, in general. Unsustainable practices that are detrimental to the life of human beings and other-than-human beings need to be sanctioned and/or remedied. Complementarily, in the context of global socio-environmental change, the worldviews, forms of knowledge, values, and ecological practices of cultures that are sustainable should be respected, and eventually adapted through intercultural exchanges.
- (iii) In contrast to mainstream modern ethics that focus on human habits without considering their habitats, the biocultural ethic couples the human habits with the habitats and the communities of co-inhabitants. The habits, habitats, and

---

<sup>1</sup>Since the 1960s, the term biocultural has been gradually adopted by the sciences of human evolution (Bowles 1966, Baker 1969, Fischler 1979, Katz 1979, 1980), ecology (Bennett et al. 1975), psychology and anthropology of health (Pepitone 1976, Moore et al. 1980), ecological restoration (Allen 1988, Janzen 1988) and ethnobiology (Baer 1989, Maffi 2001, 2005). In 2000, I coined the term *biocultural conservation* to emphasize that “1) conservation biology issues involve [ontologically, epistemologically, and ethically] both humans and other living beings, 2) biological and cultural diversity are inextricably integrated, and 3) social welfare and biocultural conservation go together” (p. 10, Rozzi 2001). Then I introduced the term *biocultural homogenization* to indicate how the homogenization of cultural habits, particularly in education, leads to the homogenization of habitats, and vice-versa (Rozzi et al. 2008). *Biocultural ethics* projects these concepts from a descriptive domain into normative one (Rozzi and Massardo 2011).



**Fig. 2.1** The formal proposal of biocultural ethics can be illustrated by a combination of three inclusive triangles. *Interior triangle*: The “3Hs” of biocultural ethics: Habits, Habitat, and co-in-Habitant. *Intermediate triangle*: The 3Hs’ interrelationships involve biophysical, symbolic-linguistic, and institutional-sociopolitical-technological domains. *Outside triangle*: The 3Hs’ interrelationships are understood by three families of worldviews: (i) pre-Socratic and other non-mainstream Western philosophies, (ii) Amerindian and other non-Western ecological worldviews, and (iii) contemporary ecological-evolutionary sciences

co-inhabitants (the “3Hs” of biocultural ethics) involve biophysical, symbolic-linguistic, and institutional-sociopolitical-technological domains (Fig. 2.1). Within each of these domains, it is necessary to consider the relations of power and differential responsibilities regarding the causes and solutions of environmental problems. These are not merely descriptive statements but normative statements with the aspiration of practical truth. Biocultural ethics aims to contribute to ecosocial justice through the conservation of biological and cultural diversity.

In the context of global climate change, and more broadly global environmental change, biocultural ethics is particularly relevant because it enables a better distinction of specific responsible agents of environmental problems. It also provides a clearer understanding about the value of diverse sustainable forms of ecological practices, and worldviews that have co-evolved within specific ecoregions. Applied biocultural ethics fosters a greater investigation and valuation of biological and cultural diversity, and their interrelationships, in education programs, policy making, and everyday culture, to counterbalance the linguicide, biocide, and increasing poverty derived from biocultural homogenization.

In the first section of the chapter, I discuss biocultural homogenization, an under-perceived, but pervasive, global process that reaches places as remote as the

southernmost islands of the Americas, or the high Andean communities in South America. In the second section, I examine the foundations provided by pre-Socratic Western philosophy, and by Amerindian cultures examined with an ecological and biogeochemical perspective for a biocultural ethic. In the third, I discuss biocultural conservation and the Field Environmental Philosophy (FEP) methodological approach that integrates ecological sciences and biocultural ethics into research, formal and non-formal education, and socio-environmental policies at local, national, and international scales.

## 2.1 Biocultural Homogenization

### 2.1.1 *A Pervasive Socio-ecological Problem, Even at the Far South*

I will introduce the concept of biocultural homogenization through a case study at the southern end of the Americas. The sub-Antarctic Magellanic ecoregion has been identified as one of the last 24 wilderness areas remaining in the planet ([Mittermeier et al. 2003](#)), which includes glaciers, fjords, highlands, tundra, and the southernmost forests of the world where over 1,000 endemic plant species grow exuberantly ([Armesto et al. 1998](#); [Rozzi et al. 2012](#)). Amid these lush landscapes, it strikes us that upon entering into the cities of the Magellanic region we do not find any of the native trees in gardens or parks. When we look closely at the trees of the central plazas of each of the major cities, we recognize trees from Europe, North America, and Asia ([Rozzi et al. 2003](#)). Moreover, the flora of the central plazas in the remote Magellanic cities more closely resembles the flora of the plazas in Madrid, New York, or Vancouver, than the flora of the forests that grow a few kilometers outside the austral cities in the sub-Antarctic Magellanic ecoregion. What causes this decoupling between the lush flora of the region and the flora planted in cities? Why are only European, North American, and other exotic species selected and valued for ornamental purposes? Who decides which tree species are planted in squares? To answer these questions we investigated which species of plants were known and valued by decision makers, educators, and other community members in the Magellanic region. The first question we asked them was: What are the first three plants that come to mind? To our surprise, more than 75 % of the responses referred to exotic plants, of which two species concentrated more than half of the answers: roses and apple trees. Among the five most cited plants were also tropical palm trees ([Rozzi et al. 2008a](#)). Hence, the floristic mindsets of decision makers gave much more attention to cosmopolitan plants, ornamentally used in cities around the world, than to the unique plants of the region. As a consequence of the habit of knowing and valuing a few cosmopolitan species more than regional plants, the habitats are planted with cosmopolitan trees and flowering shrubs and herbs. In turn, everyday encounters of citizens with cosmopolitan trees and flowers reinforces the appreciation for them, and the neglect of native plants.



**Fig. 2.2** Contrast between the Andean native biocultural reality outside the school and the Eurocentric global biocultural reality inside a classroom of a rural school in Cuenca, Ecuador. (a) Across the street of the school grows a shrub of *Brugmansia arborea*, a plant native to the Ecuadorian Andes that represents a biocultural keystone species because its flowers and seeds are used by shamans. (b) Mothers who are bilingual speakers of Quichua and Spanish arrive to pick up their children at the school. (c) Inside the classroom, the nation-state symbols – the Ecuadorian flag, national seal, national anthem in Spanish, first president of the Ecuadorian nation-state, and roses – stand out. (d) On another wall of the classroom, a symbol of the Catholic religion, the Virgin Maria and roses. (e) On a third wall, a symbol of North American globalization, a Donald Duck character and a map of the region of Cuenca. For the cultural significance of roses in Christianity, see Michael Touw (1982). For the cultural significance of Donald Duck in the context of global neoliberalism, see Ariel Dorfman and Armand Mattelart (1975)

The positive feedback between cosmopolitan habits and habitats found at the southern tip of the Americas does not represent an exceptional case; it is rather the norm, repeating itself recurrently throughout the continent and the world. For example, in the Andean region of Cuenca in Ecuador, we found that roses and exotic plants also prevail in the classroom decoration and textbooks used in rural schools, while outside the school a rich native flora grows in the paramo (Fig. 2.2). Regarding languages and culture, Spanish and colonial culture prevail in the school curricula, while Aymara and Quechua language and Amerindian cultural traditions are maintained in the paramo outside the school. Inside schools a globally homogenous mind

is educated; a mind that acquires globally homogenous habits and, in turn, builds globally homogenous habitats. I call this type of process that generates a positive feedback between cosmopolitan habits and habitats, *biocultural homogenization* (Rozzi 2001).

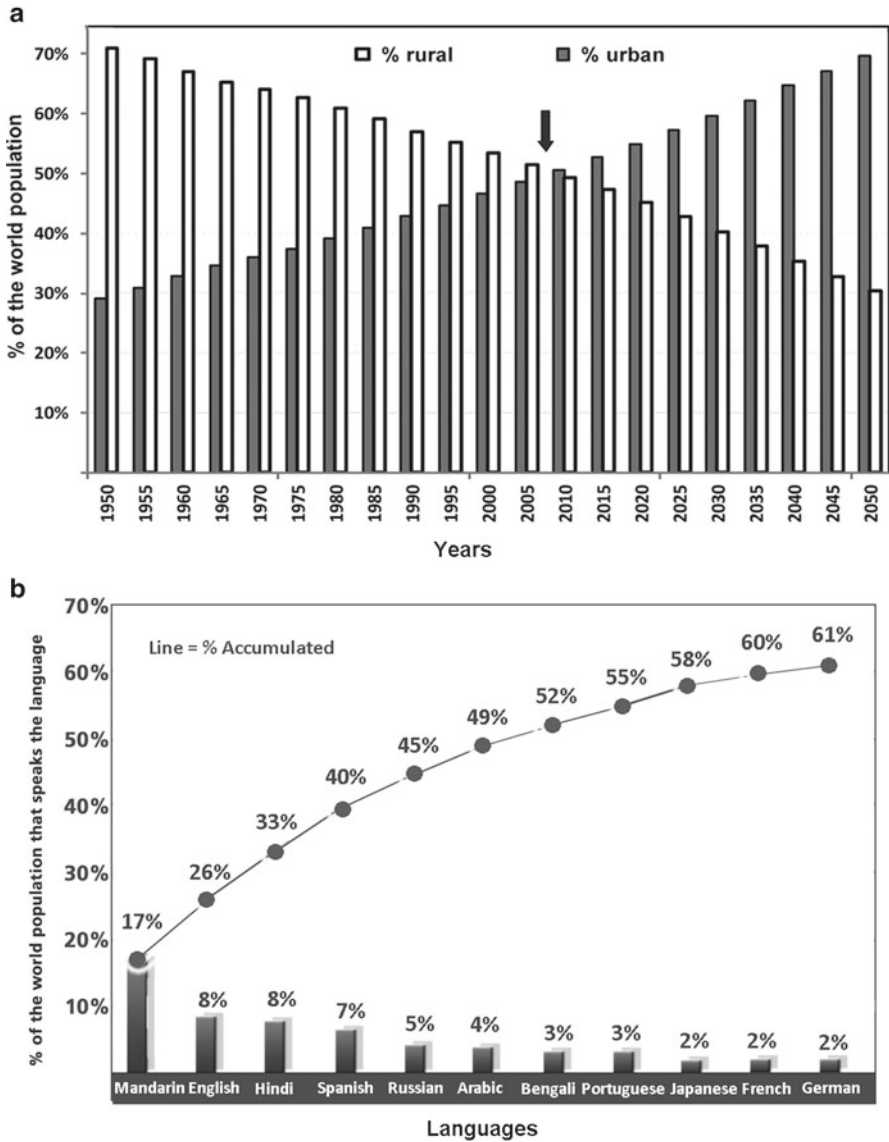
Biocultural homogenization is a pervasive, but underappreciated, driver of today's rapid global environmental change. It entails simultaneous and interlocked losses of native biological and cultural diversity at local, regional, and global scales. This process leads to the disruption of co-evolutionary interrelationships between cultures and their land, and massive replacements of native biota and cultures by a few cosmopolitan species, languages, and cultures (Rozzi 2003). The problematic character of biocultural homogenization does not reside on cosmopolitan biota, languages and/or cultural habits *per se*. The problem resides instead in the unbalanced relationship that global society creates favoring a narrow set of species, languages, and cultural habits at the expenses of the regional native ones (see Chap. 3 by Simberloff, in this volume).

During the past three decades, biotic homogenization has been investigated by ecologists (McKinney and Lockwood 1999; Simberloff and von Holle 1999; Olden and Rooney 2006), while cultural homogenization has been researched by social scientist or humanists (Schaedel 1979; Petitat 1987; Quijano 2000; Rizvi and Lingard 2000). Biocultural homogenization interrelates these two processes. It requires to investigate sympatric and synchronic coupling of processes of biotic homogenization and of linguistic/cultural homogenization, and to examine questions such as: Why do educators, policy makers, and citizens have so many difficulties perceiving the ecological and social consequences of biocultural homogenization? Why do they fail understanding and respecting the value that regional native habitats and traditional cultural habits and languages have for the identity, autonomy, and well-being of the regional co-inhabitants? In Latin America, I distinguish three core processes associated with recent urbanization and formal education that explain the origin of those difficulties and the fostering of *biocultural homogenization* today: rural–urban migration, linguistic homogenization, and reduction of philosophy education.

## **2.1.2 Three Drivers of Biocultural Homogenization**

### **2.1.2.1 Rural-Urban Migration**

At the beginning of the twenty-first century, for the first time in the history of the human species, *more than 50 % of the world's human population lives in cities* (Flavin 2007). The massive rural to urban migration is a very recent phenomenon (Fig. 2.3a). It has been especially marked in Latin America where urban population has grown from 41 % in 1950 to 79 % in 2010 (UNDESA 2011). This rural-urban migration has severe consequences for both the native habitats and the cultural habits and human well-being. *Regarding the native habitats*, the rural-urban migration



**Fig. 2.3** (a) Relative percentages of rural and urban world population since 1950 (70 % rural vs. 30 % urban), including estimated percentages until 2050 (30 % rural vs. 70 % urban). The arrow indicates the turning point in 2007 when, for the first time in human history, the proportion of urban population surpassed the rural one. (b) Dominant languages spoken in the world in 2010. Bars illustrate the relative percentage of the world population that speaks each of the dominant languages; the figures over the dots on the line indicate the accumulated percentage of the world population that speaks one of these languages (Modified from Rozzi 2012a)



generates a loss of the ancestral human stewards of the land. As native people and rural communities migrate to cities, temperate and tropical forests, high Andean paramo, and coastal habitats are left open today to accelerated processes of land-use changes, including large-scale mining and expansion of monocultures associated with a concentration of the land property (Ceccon and Miramontes 1999; Tobasura 2006; Finer et al. 2008). *Regarding human habits and well-being*, in the cities, displaced indigenous people, peasant and fishermen communities frequently lack access to basic services, such as food, water, shelter, and sanitary conditions; hence, they face extreme poverty conditions that are rapidly expanding in the marginal neighborhoods of metropolis areas in Latin America (Parentelli 1996; Gebara 1999; Rozzi 2001). Additionally, because of the intensive rural-urban migration most populations have lost everyday contact with their regional biological and cultural diversity. The knowledge that most teachers, authorities, new generations of students, and the majority of citizens have about biological and cultural diversity is acquired in urban contexts, distanced physically, emotionally, and ethically from the regional habitats, their communities of co-inhabitants and diverse life habits (Feinsinger et al. 1997; Leopold 2004).

### **2.1.2.2 Linguistic Homogenization**

At the beginning of the twenty-first century, for the first time in the history of the human species, *more than 50 % of the world's human population inhabits in the symbolic-linguistic domain defined by only seven of the dominant languages*: Mandarin, English, Hindi, Spanish, Russian, Arabic, and Bengali (Fig. 2.3b). These seven languages represent only a minimal fraction (0.1 %) of the 6,909 languages that are still spoken around the globe. This linguistic homogenization drastically reduces the spectrum of concepts and worldviews with which biological and cultural diversity are perceived, understood, and valued. In formal education worldwide, less than 10 % of the living languages are taught around the planet (Maffi 2001). Hence, formal education represents a major driver of linguistic homogenization (Krauss 1992; Maffi 2005). In most Latin America countries, indigenous languages are still ignored or only marginally incorporated into formal education, and Spanish continues to be taught as the unifying language of the nation-states. Consequently, monolingualism of the colonial language has been imposed. A linguistic homogenization has been generated, and today linguistic diversity is even more endangered than biological diversity in this continent (Lizarralde 2001). In Chile, for example, 50 % of the native languages are already extinct, and a third will become extinct during this decade (Table 2.1).

### **2.1.3 Reduction of Philosophy Education**

Since the 1970s, under the growing dominance of a neoliberal regime, the Latin American nation-states have transitioned from a period of modernization to one of

**Table 2.1** Characterization and conservation status of the Amerindian languages spoken within the Chilean territory at the arrival of the Spaniards

Vernacular	Language name			Linguistic classification	Dialects	Distribution in Chilean administrative regions	Number of speakers			Conservation status
	Spanish	English					Distribution in other Countries	Chile	Total	
1 Aymara	Aymara	Aymara	Aymaran	Northern (I & II)	Bolivia, Peru	50,000	>1,500,000		Currently Spoken	
2 Runasimi	Quechua	Quechua	Quechuan	Northern (I & II)	Colombia, Ecuador, Peru, Bolivia, Argentina	6,000	10,000,000		Endangered in Chile	
3 Uruquilla	Chango		Unclassified	Northern Coast (I-IV)	-	0	0		Extinct	
4 Kunza	Atacameño	Kunza	Unclassified	Northern (I-III)	-	0	0		Extinct	
5 Diaguita	Diaguita	Diaguita		Northern (III-V)	-	0	0		Extinct	
6 Mapudungun	Mapudungun	Mapudungun	Araucanian	Central-South (IV-X)	Argentina	600,000	550,000		Currently Spoken	
				Central-South (IV-VIII)	-	0	0		Extinct	
				Andean South (VIII-IX)	Argentina	5,000	?		Survey needed	
				Coastal South (VIII-IX)	-					
				South (IX-X)	-					
				South (X)	-	0	0		Extinct	
7 Chono	Chono	Chono		South (XI-XII)	-	15	15		Nearly extinct	
8 Kawesqar	Kawesqar	Kawesqar	Alacalufan/Fuegian	South (XI-XII)	-	0	0		Extinct	
				Kakauhua	-					

(continued)

Table 2.1 (continued)

Language name		Distribution in Chilean administrative regions			Number of speakers		Conservation status		
Vernacular	Spanish	English	Linguistic classification	Dialects	Distribution in other Countries	Chile		Total	
9 Aoniken	Tehuelche	Tehuelche	Patagonian		South (XII)	Argentina	0	30	Nearly extinct/ extinct in Chile
10 Selk'nam	Selk'nam	Selk'nam	Fuegian		Tierra Del Fuego (XII)	Argentina	0	0	Extinct
11 Yaghan	Yaghan	Yaghan	Language Isolate/Fuegian		Southernmost Archipelagoes (XII)	Argentina	1	1	Nearly extinct/ extinct in Argentina
12 Rapanuí	Pascuense	Rapanuí	Austronesian		Easter Island and Continental Chile	-	1,800 & 400	2,200	Survey needed

Data from Lewis (2009), updated from Rozzi (2002)

“monetarization” (Larraín 1996). The culture of free-market society has reduced biodiversity to mere “natural resources” (see Chap. 28 by Poole et al., this volume). Philosophy could play a major role to overcome the reduction of the prevailing economic language in formal education. However, the role that philosophy education has played in the region was severely curtailed under the rule of military dictatorships, during the decades of the 1960s, 1970s, and 1980s. During that period the teaching of ethics and philosophy was suppressed and/or drastically minimized in the curricula of primary, secondary and higher education in most Latin American countries. The reopening of philosophy programs has not removed the conceptual barriers to understanding regional processes of biocultural homogenization because philosophy is prevailingly taught from Eurocentric perspectives. Ecological, social, political, economic, and cultural contexts, as well as Amerindian worldviews and Latin American thinkers are omitted (Nascimento and Griffith 2012; Rozzi 2012a, b). Instead, Eurocentric perspectives are being legitimized under the assumptions of objectivity, science, and technology (Castro-Gómez 2005a, b). Today’s teaching of philosophy remains largely “blind” with regard to the unique biocultural attributes of the Latin American ecoregions.

## 2.2 Biocultural Ethic

The “philosophical blindness” about biocultural homogenization favors the continuity of uniform educational programs that end up serving economic mega-projects (e.g., large-scale mining, hydroelectric dams, monocultures such as eucalyptus or soybean plantations, shrimp pools or salmon-culture), which frequently cause massive losses of biological and cultural diversity, entailing socio-environmental injustice. Biocultural ethic counteracts this trend by integrating an ecological-philosophical conceptual framework that understands that the conservation of some regional habitats and life habits is critical for the identity and well-being of human and other-than-human co-inhabitants. Consequently, the conservation of habitats and access to them by communities of co-inhabitants becomes an ethical imperative.

The recovery of the understanding of habitats-habits interrelationships may seem obvious to ecologists, but it is not for philosophers because modern deontological and utilitarian ethics that prevail today address ethical matters mostly in universal terms (see Chap. 16 by Palmer, Chap. 9 by Callicott, and Chap. 20 by Northcott in this book). A biocultural ethic differs not only from the dominant modern ethics but also from the prevailing environmental ethics. It proposes a post-Leopoldian paradigm to better understand and value the role of cultural diversity. For example, in his influential essay “The Land Ethic”, Aldo Leopold (1949) proposes a misleading ethical sequence that evolves from the Decalogue to the golden rule, to democracy, and culminates with the land ethic (p. 238). Such a sequence suggests a linear progress of ethics through Western history. In contrast, a biocultural ethic emphasizes that history is not linear, because multiple biocultural worldviews and ethics take place simultaneously in different cultural groups, within and beyond Western civilization, in the past and today.

It is necessary that I explain why I speak of “the recovery” of the understanding of the links between human habits and habitats. These links have been ignored by the dominant modern ethics. However, as we show below, an understanding about the interrelationships among the habits, habitats, and the identity of human and other-than-human co-inhabitants is present in (1) pre-Socratic Greek thought and the archaic meaning of the word *ethos*, (2) ancestral Amerindian and other non-Western worldviews, and (3) recent perspectives of ethological, ecological, evolutionary, biogeochemically, and health sciences (see Fig. 2.1).

### 2.2.1 *Habitats and Habits in the Archaic Meaning of Ethos and in Contemporary Sciences*

The word *ethics* originated from the Greek term *ethos*, which in its most archaic form meant a *den*: the abode of an animal.<sup>2</sup> The first written record of the term *ethos* is around 1000 B.C., in the Iliad and the Odyssey, where Homer used the term in its plural form *ethea* to refer to the “habitual haunts of the animals”, especially the stables horses (Frobish 2003). Two centuries later, Hesiod expanded the meaning of *ethea* by using it to refer to the “habitual abodes of men,” and also to the “customary *habits* of men or gods.”<sup>3</sup> Interpreted today with concepts of ecological sciences, we can refer to the two meanings that Hesiod gives to the term *ethos* as “habitat” and “habits.”

The two ecological meanings of *ethos* were used with variations by several of the lyric Greek poets in the sixth and fifth centuries B.C. Pindar used *ethos* to refer to humans and wild animals, and added a third meaning to it by introducing the distinction between the habits practiced and the innate dispositions. In the Olympians he wrote that “neither the fox nor the lion can change its *ethos*.” Regarding the humans, Pindar affirmed that “it is difficult to conceal one’s *ethos*.” From these records of the ancient Greek poets, we can learn three facts that are relevant to establish a biocultural ethic:

- (a) The original meaning of the word *ethos* refers to a *place*, the abode of an animal; in ecological terms, a *habitat*.
- (b) A second archaic meaning of *ethos* refers to *customs*; in ecological terms, *habits*.
- (c) The two previous meanings of *ethos* are used to refer to both humans and other animals.

---

<sup>2</sup>For the origin of the term *ethos* see Juliana Gonzalez (1996) *El Ethos, Destino del Hombre*. Mexico City: Fondo de Cultura Económica, pp. 9–12. Nolbert Bilbeny (2012, *Ética*. Barcelona, Spain: Ariel) provides an explanation about the terms *êthos* and *éthos*. See also H. G. Liddell and R. Scott, *A Greek-English Lexicon*, 9th ed. (New York: Oxford Press, 1996).

<sup>3</sup>For a concise historical account of the meaning of the term *ethos* in the pre-Aristotelian period see Shirley Darcus “Daimon as a force in shaping *ethos* in Heraclitus,” *Phoenix* 28 (1974): 390–407.

From these three facts, we can conclude that in its origin the concept of *ethos* implied a unified view that contrasts with dualisms that govern modern ethics. Conducted with the lens of an ecological-evolutionary hermeneutic, the etymological research also reveals remarkable coincidences between the meaning of the pre-Socratic term *ethos* and contemporary scientific perspectives. For the foundation of a biocultural ethic, both pre-Socratic and scientific perspectives offer a valuable integration of ecological and evolutionary attributes:

1. *Ethos* means both the place where one lives and the ways in which one lives; in terms of the ecological sciences, this concept integrates the *habitat* and the *habits* of the inhabitants.
2. *Ethos* refers to innate dispositions as well as to practiced or acquired habits; in terms of the biological sciences, it integrates the concepts of genotype and phenotype of the inhabitants.
3. *Ethos* is used to refer to human nature in a way much like the nature of other animals; in terms of evolutionary sciences, the phylogenetic relationships explain the degree of similarity regarding genetic, anatomical, physiological, ethological habits among different animal species, including *Homo sapiens*.

The unifying vision contained in the multidimensional meaning of *ethos* in ancient Greece, however, was lost after the fourth century B.C. with the prevalence of the work of Aristotle. The term *ethos* was used by Aristotle at the beginning of his book two of *The Nicomachean Ethics* to affirm that “moral or ethical virtue is the product of habit (*ethos*), and has indeed derived its name, with a slight variation of form, from that word” (p. 1). Aristotle focuses only on human habits.<sup>4</sup> He does not include non-human animals; nor does he consider the diversity of native habitats and their interrelationships with the diversity of human habits. Instead he focuses on the *polis*, the Greek city-state, and its citizens.<sup>5</sup> Thus, with Aristotle the habitat-habit and human-animal integrations included in the pre-Socratic meaning of *ethos*, are excluded from prevailing Western ethics.

The reduction of the scope of meaning of *ethos* that Aristotle does by focusing on citizens and excluding other humans and other animals, has endured in modern ethics. The major modern ethical schools have had as a model the habits of modern European citizens. This reduction of the scope of ethics has been functional to European colonialism: it has imposed the habits of the conqueror on the conquered “as if” these habits should be cultivated regardless of the habitats and communities of co-inhabitants where they occur. With notable exceptions, such as Bartolome de las Casas, in Latin America the ethics of the conquistadors has had little or no regard for the communities

---

<sup>4</sup>See the analysis of Aristotle’s *Nicomachean Ethics* by Arthur Miller in “Aristotle on habit and character: implications for the *rhetoric*,” *Speech Monographs* (1974) 41: 301–316.

<sup>5</sup>A pertinent analysis of Aristotle’s focus on the *polis* is offered by Alasdair MacIntyre (2007) “After Virtue,” Third Edition. Notre Dame, Indiana: University of Notre Dame Press. See also “Aristotle’s Concept of Ethos, or if not his Somebody Else’s,” *Rhetoric Review* 1 (1982): 58–63, by Michael Halloran who highlights Aristotle’s focus on the *polis* as the milieu where the habits are cultivated.

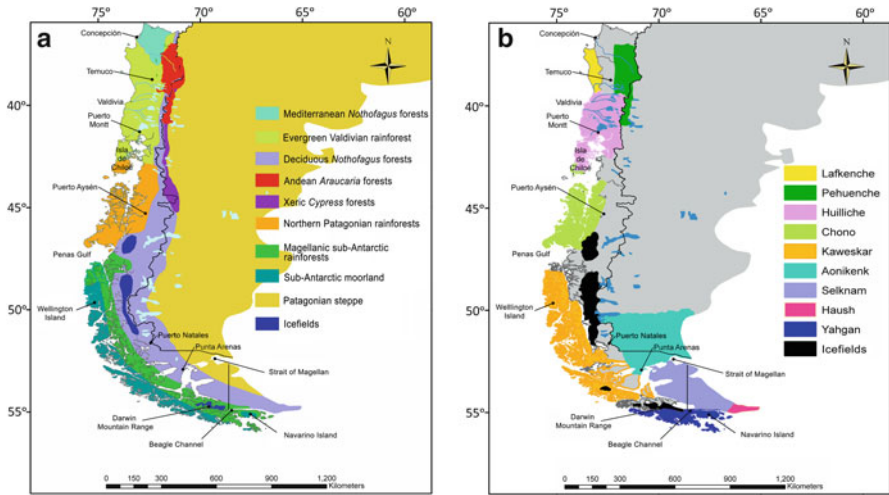
of conquered co-inhabitants. This situation continues in our postcolonial period, under the hegemony of economic megaprojects that pay little attention to the habits and habitats of the communities where homogeneous development models are imposed.

Biocultural ethics proposes a decolonizing turn by problematizing the relationships between human habits, the habitats, and the communities of co-inhabitants. For this endeavor, interdisciplinary teamwork among ecologists and philosophers enables a recovery of the archaic meaning of *ethos* adding novel insights from scientific perspectives. Under an ecological, evolutionary perspective, the meaning of *ethos* includes both the substantive *habitat*, and the verb *to inhabit*. Both meanings become intertwined through the evolution of recurrent forms of inhabiting – i.e., *habits* – in a given habitat. In performing these habits, both the biological and the cultural identity or character of the inhabitants are formed. The moral character is cultivated by habits that involve co-evolutionary relationships that include not only citizens, but also a diversity of human and other-than-human co-inhabitants. The co-inhabitants are mutually modified by their recurrent interactions that shape their habits and habitats. Along interactions with other beings, the *ways of inhabiting* of each being evolve towards *ways of co-inhabiting* within communities of co-inhabitants. Understanding the diversity of beings as *co-inhabitant subjects* (as opposed to mere objects) expands the horizons of the moral community beyond the Western citizen community, and far beyond the human community.

### **2.2.2 Amerindian Habits – Habitats – Co-inhabitants, Biogeochemical Cycles and Linguistics**

The holistic integration of habitats and habits, ecosystems and cultures, is also manifest in ancestral Amerindian ecological knowledge. It is notable how closely interrelated are the biophysical domains and the symbolic-linguistic domains regarding the distribution of habitats, languages, and the naming of places, humans, and other living-beings among Amerindian cultures. Stuart Chapin and collaborators (Chap. 4 in this book) report a close match between the distribution of cultures and the distribution of habitat types in northern North America. A mirror image can be found in southern South America. Compare Fig. 4.1, which depicts the Alaskan habitat types and cultural-linguistic groups, with Fig. 2.4, which shows the close matches of the distribution of habitat types and the distribution of dialects and main communities for the largest south-western South American Amerindian ethnic group, the *Mapuche*.

The Mapuche define themselves as people (= *che*) of the land (= *mapu*). Further, the names of their three main linguistic and cultural groups refer to the habitats they inhabit. The *Lafkenche*, *Williche*, and *Pewenche* are respectively the people of the *Lafken* or coastal habitats (36–40°S), of the *Willi* or southern evergreen rain forests (38–42°S), and of the *Pewen* or Monkey-Puzzle tree (*Araucaria araucana*) forests on the volcanic Andean mountain range in southern Chile and Argentina (37–40°S).

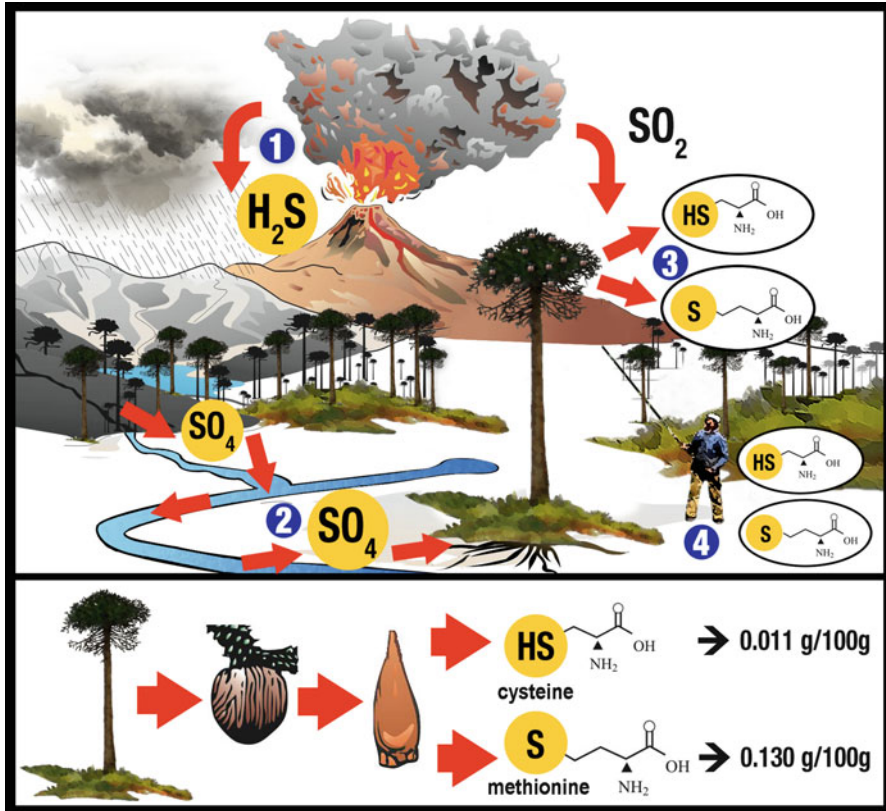


**Fig. 2.4** Forest types and ethnographic maps of south-western South America. There is a high overlap between the distribution of habitat types and the distribution of cultures. (Modified from Rozzi et al. 2010)

Like native Alaskans, the *Pewenche* have been defending their territories during the last decades. Since the 1980s they have been opposing the construction of dams on the Bio-Bio river that which would flood their *Pewen* forests (Baquedano 2004). The social organization and ancestral distribution of the *Pewenche* clans is closely associated with the patches of *Pewen* trees on the volcanic soils (Aagasen 1998; Hermann 2006), and an essential habit is the gathering of *Pewen*'s seeds that provide the nutritive foundation of their diet (Tacón 1999). From the perspective of health sciences, it is relevant that *Pewen*'s seeds have high levels of cysteine and methionine, the only two amino acids that contain sulfur in their molecular structure. In addition, methionine is an *essential amino acid*; i.e., the human body is unable to synthesize it. Hence a lack of methionine can cause a protein deficiency (Rozzi and Massardo 2001).

In summary methionine is an amino acid that must be obtained through an external nutritive source, such as the *Pewen* seeds. Consequently, the medical science perspective provides a functional explanation of this *Pewenche* habit. The *Pewenche* worldview also converges with an ecological perspective of the sulphur cycle (cfr. Schlesinger 2013). This biogeochemical cycle illustrates that when the *Pewenche* eat the *Pewen* seeds, they ingest the sulfur molecules that come directly from a trees, and indirectly from volcanic rocks and ashes (Fig. 2.5). Through their alimentary habits, the *Pewenche* incorporate into their bodies the molecules that were synthesized by the *Pewen* trees; therefore, biophysically they are people or “che” of the “*Pewen*.” In turn, the sulphur atoms of these amino acid molecules synthesized by the *Pewen* had their origin in the volcanoes of the land; therefore, biophysically they are also “che” of the “*Mapu*.” The analysis of the Amerindian names combined with the health and





**Fig. 2.5** Biogeochemical cycle of sulphur (S), including the *Pewenche* habit of gathering *Pewen* seeds in the *Pewen* forest habitats on the volcanic lands of southern Chile. (1) The entrance of sulfur (S) into the biogeochemical cycle comes from the volcanoes and their ash, which is transported by wind and water. Rivers bring the volcanic sulfur to the soils. (2) On the soils, bacteria and fungi transform, through processes of oxidation and reduction, molecules of hydrogen sulfide ( $\text{H}_2\text{S}$ ) and sulfur dioxide ( $\text{SO}_2$ ) emitted by volcanoes into molecules of sulfate ( $\text{SO}_4$ ), which in this chemical form can be absorbed by the roots of the *Pewen*. (3) Once inside the tree, a chain of metabolic reactions begins in the vegetable cells, where enzymes assimilate sulfur from the inorganic molecules of sulfate, incorporating them in a process of synthesis of organic molecules that generate the two essential amino acids that contain sulfur: methionine and cysteine. (4) Therefore, when the people (*che*) eat the seeds with the amino acids synthesized by the tree (*Pewen*), they are also eating the sulfur of the volcanic land (*Mapu*)

biogeochemical sciences analyses show that both the symbolic-linguistic and the biophysical bodies of the *Pewenche* and the *Mapuche* are interwoven with their habits (gathering of *Pewen*'s seeds), their habitats (*Pewen* forests on volcanic land), and their co-inhabitants (*Pewen* trees, volcanoes, humans or *che*).

The comparative analysis between the Amerindian *Pewenche* worldview and the Western ecological-medical sciences did not intend to validate any of these forms of

knowledge. The purpose of the comparative analysis was to achieve an intercultural dialogue and translation, and to accomplish policies that could reconcile contrasting, often conflicting, positions and interests of the stakeholders. The location of the projected dam on the Bio-Bio River was modified after observations added to the Environmental Impact Assessment of the project. However, the *Mapuche-Pewenche* rights to their ancestral lands is still in continuous peril, and their ecological knowledge and values are still largely ignored in conservation, educational, and development policies by the Chilean government ([Rozzi and Massardo 2011](#)). The Mapuche worldview and its values are, nevertheless, alive in *Pewenche* voices such as the poet Leonel Lienlaf (1989), who today writes:

**Mañkean ñi dungu**

*Umagtuken  
lafken pewmamu ina nepeken  
challwa nepenmu.  
Ayeken kümemew,  
Ngümaken mawümmew  
feley ta ñi mongen,  
feley ta ñi nütram,  
fewla umagtuan.*

**Mañkean's dream**

My laughter is the midday sun,  
my tears are the spring waters,  
my sleep is the rest of love,  
and my waking up is the life of the fishes.  
Thus is my existence,  
so is my word,  
and the waters continue singing to me.<sup>6</sup>

Lienlaf's bilingual (*Mapudungun* and Spanish) poems express the awareness of a common genealogy of human and other-than-human co-inhabitants, whose flows of energy and matter are interconnected. Human Beings and other beings walk together. The pain of one is the pain of the other. The water of the spring waters is the water of the tears. Biological diversity and cultural diversity beat together. The welfare of human beings and other living and non-living beings go hand in hand. In the past and today, among Amerindian as much as among non-mainstream Western cultures, we find that human habits are connected to the biocultural community of co-inhabitants. This connection seems to be the norm, and the current disconnection of global society seems to be an exception, but an exception that today is dominant and needs to be rectified.

## 2.3 Biocultural Conservation and Field Environmental Philosophy

The richness and value of the intricate South American reservoir of biological and cultural diversity is not appropriately acknowledged by global society today. The rhetoric of modernization and economic growth that governs globalization omits

---

<sup>6</sup>*Mañkean ñi dungu* (El sueño de Mañkean) in Leonel Lienlaf (1989) *Se Ha Despertado el Ave de mi Corazón*. Santiago de Chile: Editorial Universitaria. Translation from Spanish to English by Ricardo Rozzi.

and marginalizes the majority of humans and almost the totality of other beings. It displaces them from their native habitats and excludes them from the main discourses and laws that govern neoliberal global society. Argentinean liberation philosopher Enrique Dussel (2011) refers to the current era of globalization as *the era of marginalization of the majority*. This exclusion leads to the oppression and/or extermination of the diversity of living beings, languages, and cultures that co-inhabit South America. A higher recognition of the value of biocultural diversity demands an environmental justice that includes poor and marginalized people: the oppressed human beings side-by-side with the oppressed other-than-human beings (see Chap. 19 by Hayward, Chap. 20 by Northcott, and Chap. 21 by Mallory this book). In terms of Brazilian liberation theologian Leonardo Boff (1997) “without a minimum of social justice it is impossible to make ecological justice fully effective; the one involves the other” (p. 45). Boff radically calls for a *dignitas terrae*. Biocultural ethics coincides with Boff in this call because it acknowledges the dignity of the co-inhabitants that are currently marginalized. Biocultural ethics demands incorporating this value of the co-inhabitants subjects into development policies as a matter of socio-environmental justice.

The socio-environmental justice demanded by biocultural ethics would also contribute to achieve socio-environmental sustainability at the planetary level. South American ecosystems play a critical role in the regulation of climate and conservation of biodiversity at the world level. What happens to the climate in Asia and other continents depends in part on the conservation of the forests in the Amazon. In turn, what is happening today in the Amazon depends partly on environmental policies in Asia and other continents. Therefore, today a South-North, East-West, planetary interregional biocultural ethic is imperative.

In the ecosystems of South America a plethora of past and current cultures has developed environmental worldviews and sustainable ecological practices, which are adapted to heterogeneous environmental conditions. The value of these worldviews and practices for environmental ethics has only recently begun to be considered by philosophers. The Cuban intercultural philosopher Raul Fornet-Betancourt (1998) criticizes that the history of philosophy shouldn't be reconstructed on the basis of an expansionary Eurocentric development, but by means of the diversity of all cultures of humankind. Intercultural philosophy is a means for making the variety of voices heard, and achieving a just sustainable global society. Biocultural ethics coincides with Fornet-Betancourt regarding the need of an intercultural dialogue. However, it attempts to take a step further: to gain awareness about the coexistence of diverse life forms, and to recover the capacity of citizens to communicate with the diversity of humans and the diversity of other-than-human beings, as well. This biocultural communication is not merely rational or verbal; it also requires the involvement of corporality, affection, and the experience of co-inhabitation in everyday life.<sup>7</sup> Biocultural communication can be cultivated not only in remote

---

<sup>7</sup>The Chilean neurobiologist Francisco Varela and his collaborators (1995) developed an epistemology and ethics that integrates affective, physiological and psychic dimensions. Regarding interspecific communication among plants and animals, including *Homo sapiens*, see the recent line of interdisciplinary research in ecological semiotics by Kalevi Kull and collaborators (2009).

places such as Cape Horn or Alaska, but also in the everyday habitats of cities (see Chap. 7 by Klaver, in this volume; Taylor 2010).

Since the 1960s, Latin American liberation philosophy and liberation pedagogy have emphasized the need to enhance the expression of pluri-versal epistemologies and local histories of communities that exist at the borders of globalization (Rozzi 2012b). Liberation philosophy (Dussel 1980), liberation theology (Gutiérrez 1973), and liberation pedagogy (Freire 1970) have criticized both epistemological and economic colonialism. They have focused on the severe oppression suffered by the growing number of poor human communities, who today live mostly in the slums of cities. Biocultural ethics complements liberation philosophy by emphasizing that to achieve equity and sustainability we have to also criticize colonial anthropocentrism, and regain a perspective of co-inhabitation that integrates the well-being of both human and other-than-human co-inhabitants. For this task the collaboration between philosophers and ecologists is essential. Biocultural ethics builds on the tradition of Rachel Carson and Aldo Leopold (see Chaps. 13 and 14 by Cafaro and Meine, this volume), but it also incorporates a geopolitical dimension. Epistemological, political, economic, and ethical arguments and advocacy are being built from within each region, and today these arguments and advocacy acquire an interregional global scope.

At a global scale, biocultural ethics emphasizes that many communities exhibit sustainable and respectful forms of co-inhabitation (Callicott 1994). It also clarifies that many of the major environmental problems are caused by a few identifiable agents (Rozzi and Feinsinger 2001). Therefore, it is distorted, and unjust, to analyze global environmental change in terms of a general problem between humanity and the environment. To rectify this distortion, biocultural ethics needs to identify and to sanction specific agents that are responsible of socio-environmental problems. Complementarily, it also calls attention to better incorporate the diversity of local sustainable ecological practices and forms of knowledge into policy, economy and formal education. Toward this goal, at a local scale, we established the Chilean Long-Term Socio-Ecological Research network (LTSER-Chile) where we have developed a methodological approach that provides a guide for participants to theoretically and experientially understand biocultural ethics: “field environmental philosophy” (FEP) (Rozzi et al. 2012).

The adjective *field* highlights three levels of experience. First, in the field it is possible to perceive and research components and processes of biocultural diversity that are often omitted or distorted in formal education, public policy, and the prevailing discourses of global society. Second, in the field participants gain an integral, *in situ*, perception of biocultural diversity by engaging their senses, emotions, and rationality in the interactions with other beings, embedded in their biophysical, symbolic-linguistic, and/or institutional habitats. Third, and most importantly, in the field “face-to-face” encounters with other human and other-than-human beings transform the understanding of biocultural diversity: it ceases to be a mere concept and begins to be an experience of co-inhabitation, where other beings cease to be mere objects of study and acquire the status of co-inhabitant subjects.

Within the FEP approach, I define subjects as (i) autonomous beings that resist being fully comprehended by scientific models and concepts, and escape determinism

by undertaking life-paths different from those scientifically predicted, and (ii) beings that have dignity (*sensu* Boff 1995, 1997), and accordingly demand moral consideration as co-inhabitants. The concept of *co-inhabitant subjects* liberates scientists and other participants from the notion of “control of nature” and the consideration of other living beings as mere “natural resources” (see Chap. 28 by Poole et al. and Chap. 21 by Mallory, in this volume).

The adjective *environmental* in the title of the FEP methodological approach makes explicit the goal of overcoming the reduction of ethics to purely human affairs. It emphasizes that human existence is immersed in co-inhabitation relationships within communities of human and other-than-human co-inhabitants.

Finally, I call this methodological approach field environmental *philosophy*, and not merely field ecology, because it integrates *epistemological* and *ethical* dimensions. Participants address *epistemological* questions to investigate not only biological and cultural diversity, but also the methods, disciplines (sciences, humanities and arts), languages, and worldviews through which scientific and other forms of knowledge about biological and cultural diversity are forged. Participants also conduct comparative *environmental ethics* analyses of selected philosophical, ethnographic, and ecological texts, and investigate the biophysical, symbolic-linguistic, and socio-ecological dimensions of the habitats and habits of the communities of co-inhabitants. The ultimate goal of FEP, however, is that participants do not limit themselves to only learning about biocultural diversity, but also explore respectful, sustainable ways of co-inhabitation.

To effectively implement FEP in collaboration with the Regional Government of the Chilean Magellanic and Antarctic Region, the regional public university (Universidad de Magallanes, UMAG), and a non-governmental organization (Omora Foundation), we created the Omora Ethnobotanical Park in Cape Horn in 1999, and the international Sub-Antarctic Biocultural Conservation Program in 2004.<sup>8</sup> This multiple scale approach enabled the creation of the UNESCO Cape Horn Biosphere Reserve in 2005. Building of institution and infrastructure has enabled *in situ* transdisciplinary teamwork in education, policy and decision making, and innovative ecotourism programs that integrate ecological science and biocultural ethics to achieve biocultural conservation. For example, with the FEP methodological approach the Omora Park team created “Ecotourism with a Hand-Lens” to enhance the appreciation of the austral bryoflora, while at the same time providing a sustainable source of income for local communities in Cape Horn (Rozzi et al. 2008b; Goffinet et al. 2012). Today, authorities, teachers, tourist operators, and the local community of Cape Horn appreciate not only roses and apples, as it was the case in 2000, but they also appreciate mosses, liverworts, and lichens, as well as their ecological, aesthetic, economic, and ethical values.

---

<sup>8</sup>The international Sub-Antarctic Biocultural Conservation Program is coordinated by UMAG and the Institute of Ecology and Biodiversity (IEB) in Chile, and, by the University of North Texas (UNT) in the USA ([www.unt.edu](http://www.unt.edu), Rozzi et al. 2006, 2010).

A change of habit (observing and appreciating with a “hand-lens” the little sub-Antarctic flora) stimulated the conservation of a habitat (the “UNESCO Cape Horn Biosphere Reserve”). A trend of biocultural homogenization was reoriented into a path of biocultural conservation. The socio-ecological challenges of global environmental change are vast and pressing. The micro-example at the southern end of the Americas shows, however, that the transdisciplinary approach of FEP enables participants to engage in an integration of biocultural ethics and ecological sciences that goes beyond a purely case-study approach, establishing also a long-term partnership for biocultural conservation. Integrating ecological sciences and biocultural ethics broadens the conceptual and methodological spectrum of long-term socio-ecological research programs. These programs have focused on the integration of ecological and economic sciences (Ohl et al. 2007, Haberl et al. 2009), and to a lesser extent other social sciences, humanities and the arts (Swanson et al. 2008). FEP complements these approaches, and today is being incorporated into sites of the International Long-Term Ecological Research Network and other UNESCO biosphere reserves. Through a long-term work originated at the south of the world, FEP guides collaborations among ecologists and philosophers which today aim contributing to regional and global sustainability of life.

## References

- Aagesen D (1998) Indigenous resource rights and conservation of the monkey-puzzle tree (*Araucaria araucana*, Araucariaceae): a case study from Southern Chile. *Econ Bot* 52:146–160
- Aristotle (1956) *The Nichomachean ethics* (trans: Rackham H). William Heinemann, London
- Armesto JJ, Rozzi R, Smith-Ramírez C, Arroyo MTK (1998) Effective conservation targets in South American temperate forests. *Science* 282:1271–1272
- Baer A (1989) Maintaining biocultural diversity. *Conserv Biol* 3:97–98
- Baker PT (1969) Human adaptation to high altitude. *Science* 163:1149–1156
- Baquedano M (2004) *La Batalla de Ralco. De la Electricidad Sucia a la Electricidad Verde*. Ediciones Lom, Santiago
- Bennet KA, Osborne RH, Miller RJ (1975) Biocultural ecology. *Annu Rev Anthropol* 4:163–181
- Bilbeny N (2012) *Ética*. Ariel, Barcelona
- Boff L (1995) *Ecology & liberation*. Orbis Books, New York
- Boff L (1997) *Cry of the earth, cry of the poor*. Orbis Books, New York
- Bowles GT (1966) Identifying races: geography and genetics. *Science* 154:628–629
- Callicott JB (1994) *Earth’s insights: a survey of ecological ethics from the Mediterranean basin to the Australian outback*. University of California Press, Berkeley
- Castro-Gómez S (2005a) *La Hybris del Punto Cero*. Ciencia, Raza e Ilustración en la Nueva Granada (1750–1816). Editorial Pontificia Universidad Javeriana, Bogotá
- Castro-Gómez S (2005b) *La Postcolonialidad Explicada a los Niños*. Universidad del Cauca-Instituto Pensar, Popayán
- Ceccon E, Miramontes O (1999) Mechanisms and social actors in the deforestation of the Brazilian Amazon. *Interciencia* 24:112–119
- Darcus S (1974) Daimon as a force in shaping ethos in Heraclitus. *Phoenix* 28:390–407
- Dorfman A, Mattelart A (1975) *How to read Donald Duck: imperialist ideology in the Disney comic*. International General, New York
- Dussel E (1980) *Liberation philosophy*. Orbis Books, New York
- Dussel E (2011) *Ética de la Liberación: En la Edad de la Globalización y de la Exclusión*. Trotta, Madrid

- Feinsinger P, Margutti L, Oviedo R (1997) Schoolyards and nature trails: ecology education outside the university. *Trends Ecol Evol* 12:115–120
- Finer M, Jenkins CN, Pimm SL, Keane B, Ross C (2008) Oil and gas projects in the western Amazon: threats to wilderness, biodiversity, and indigenous peoples. *PLoS One* 3(8):e2932
- Flavin C (2007) Preface. In: Starke L (ed) *State of the world 2007: our urban future*. Worldwatch Institute, Washington, DC, pp xxiii–xxv
- Fornet Betancourt R (1998) Supuestos filosóficos del diálogo intercultural. *Utopia y Praxis Latinoamericana* 5:51–64
- Freire P (1970) *Pedagogy of the oppressed*. Continuum, New York
- Frobish T (2003) An origin of a theory: a comparison of ethos in the Homeric Iliad with that found in Aristotle's rhetoric. *Rhetor Rev* 22:16–30
- Gebara I (1999) *Longing for running water: ecofeminism and liberation*. Fortress Press, Minneapolis
- Goffinet B, Rozzi R, Lewis L, Buck W, Massardo F (2012) The miniature forests of Cape Horn: eco-tourism with a hand-lens. UNT Press, Denton
- González J (1996) *El Ethos, Destino del Hombre*. Fondo de Cultura Económica, Mexico City
- Gutiérrez G (1973) *A theology of liberation: history, politics, and salvation*. Orbis Books, New York
- Haberl H, Graube V, Díaz-Delgado R, Krauze K, Neuner A, Peterseil J, Plutzer C, Singh SJ, Vadineanu A (2009) Towards an integrated model of socioeconomic biodiversity drivers, pressures and impacts: a feasibility study based on three European long-term socio-ecological research platforms. *Ecol Econ* 68:1797–1812
- Halloran M (2012) Aristotle's concept of ethos, or if not his somebody else's. *Rhetor Review* 1:58–63
- Herrmann TM (2006) Indigenous knowledge and management of Araucaria araucana forest in the Chilean Andes: implications for native forest conservation. *Biodivers Conserv* 15:647–662
- Janzen DH (1988) Tropical ecology and biocultural restoration. *Science* 239:243–244
- Katz SH (1979) Un exemple d'évolution bioculturelle: la fève. *Communications* 31:53–69
- Katz SH (1980) Biocultural evolution and the is/ought. *Zygon* 15:155–168
- Krauss M (1992) The world's languages in crisis. *Language* 68:4–10
- Kull K, Deacon T, Emmeche C, Hoffmeyer J, Stjernfelt F (2009) Theses on biosemiotics: prolegomena to a theoretical biology. *Biolog Theory* 4(2):167–173
- Larraín J (1996) *Modernidad, razón e identidad en América Latina*. Editorial Andrés Bello, Santiago
- Leopold A (1949) *A sand county*. Oxford University Press, New York
- Leopold C (2004) Living with the land ethic. *BioScience* 54:149–154
- Lewis PM (ed) (2009) *Ethnologue: languages of the world*, 16th edn. SIL International, Dallas
- Liddell HG, Scott R (1996) *A Greek-English Lexicon*, 9th edn. Oxford Press, New York
- Lienlaf L (1989) *Se Ha Despertado el Ave de mi Corazón*. Editorial Universitaria, Santiago de Chile
- Lizarralde M (2001) Biodiversity and loss of indigenous languages and knowledge in South America. In: Maffi L (ed) *On biocultural diversity: linking language, knowledge, and the environment*. Smithsonian Institution Press, Washington, DC, pp 265–281
- MacIntyre A (2007) *After virtue*, 3rd edn. University of Notre Dame Press, Notre Dame
- Maffi L (ed) (2001) *On biocultural diversity. Linking language, knowledge, and the environment*. Smithsonian Institution Press, Washington, DC
- Maffi L (2005) Linguistic, cultural, and biological diversity. *Annu Rev Anthropol* 34:599–617
- McKinney ML, Lockwood J (1999) Biotic homogenization: a few winners replacing many losers in the next mass extinction. *Trends Ecol Evol* 14:450–453
- Miller A (1974) Aristotle on habit and character: implications for the rhetoric. *Speech Monogr* 41:301–316
- Mittermeier RA, Mittermeier CG, Brooks TM, Pilgrim JD, Konstant WR, da Fonseca GAB, Kormos C (2003) Wilderness and biodiversity conservation. *Proc Natl Acad Sci* 100:10309–10313
- Moore LG, Van Arsdale W, Glittenberg JE, Aldrich RA (1980) The biocultural basis of health: expanding views of medical anthropology. Waveland Press, Prospect Heights
- Nascimento A, Griffith J (2012) Environmental philosophy in Brazil: roots, intellectual culprits, and new directions. *Environ Ethics* 34:379–397
- Ohl C, Krauze K, Grünbühl C (2007) Towards an understanding of long-term ecosystem dynamics by merging socio-economic and environmental research: criteria for long-term socio-ecological research sites selection. *Ecol Econ* 63:383–391

- Olden J, Rooney T (2006) On defining and quantifying biotic homogenization. *Glob Ecol Biogeogr* 15:113–120
- Parentelli G (1996) Latin America's poor women. In: Ruether R (ed) *Women healing earth: third world women on ecology, feminism, and religion*. Augsburg Fortress Press, Minneapolis, pp 29–38
- Pepitone A (1976) Toward a normative and comparative biocultural social psychology. *J Pers Soc Psychol* 34:641–653
- Petit A (1987) School and the production of society. *Br J Sociol Educ* 8:379–390
- Quijano A (2000) Coloniality of power and Eurocentrism in Latin America. *Int Sociol* 15:215–232
- Rizvi F, Lingard B (2000) Globalization and education: complexities and contingencies. *Educ Theory* 50:419–426
- Rozzi R (2001) Ética ambiental: raíces y ramas latinoamericanas. In: Primack R, Rozzi R, Feinsinger P, Dirzo R, Massardo F (eds) *Fundamentos de Conservación Biológica: Perspectivas Latinoamericanas*. Fondo de Cultura Económica, Mexico, pp 311–359
- Rozzi R (2002) Biological and cultural conservation in the Archipelago forest ecosystems of southern Chile. Department of Ecology and Evolutionary Biology, University of Connecticut <http://digitalcommons.uconn.edu/dissertations/AAI3042909>
- Rozzi R (2003) Biodiversity and social wellbeing in South America. In: *Encyclopedia of life support systems*. UNESCO-EOLSS. <http://www.eolss.net>
- Rozzi R (2012a) Biocultural ethics: the vital links between the inhabitants, their habits and regional habitats. *Environ Ethics* 34:27–50
- Rozzi R (2012b) South American environmental philosophy: ancestral Amerindian roots and emergent academic branches. *Environ Ethics* 34:343–365
- Rozzi R, Feinsinger P (2001) Desafíos para la conservación biológica en Latinoamérica. In: Primack R, Rozzi R, Feinsinger R, Dirzo F, Massardo F (eds) *Fundamentos de Conservación Biológica: Perspectivas Latino-americanas*. Fondo de Cultura Económica, México, pp 661–688
- Rozzi R, Massardo F (2001) Similitudes y diferencias interculturales en las éticas ambientales. In: Primack R, Rozzi R, Feinsinger R, Dirzo F, Massardo F (eds) *Fundamentos de Conservación Biológica: Perspectivas Latino-americanas*. Fondo de Cultura Económica, México, pp 319–321
- Rozzi R, Massardo F (2011) The road to biocultural ethics. *Front Ecol* 9:246–247
- Rozzi R, Silander J Jr, Dollenz O, Massardo F, Anderson C, Connolly B (2003) Árboles nativos y exóticos en las plazas de Magallanes. *Anales del Instituto de la Patagonia, Serie Ciencias Naturales* 31:27–42
- Rozzi R, Massardo F, Anderson C, Heidinger K, Silander J Jr (2006) Ten principles for biocultural conservation at the Southern Tip of the Americas: the approach of the Omora Ethnobotanical Park. *Ecol Soc* 11(1):43 [online] URL: <http://www.ecologyandsociety.org/vol11/iss1/art43/>
- Rozzi R, Armesto J, Goffinet B, Buck W, Massardo F, Silander J, Kalin-Arroyo M, Russell S, Anderson CB, Cavieres L, Callicott JB (2008a) Changing lenses to assess biodiversity: patterns of species richness in sub-Antarctic plants and implications for global conservation. *Front Ecol Environ* 6:131–137
- Rozzi R, Arango X, Massardo F, Anderson C, Heidinger K, Moses K (2008b) Field environmental philosophy and biocultural conservation: the Omora Ethnobotanical Park educational program. *Environ Ethics* 30(3):325–336
- Rozzi R, Anderson CB, Pizarro JC, Massardo F, Medina Y, Mansilla A, Kennedy JH, Ojeda J, Contador T, Morales V, Moses K, Poole A, Armesto JJ, Kalin MT (2010) Field environmental philosophy and biocultural conservation at the Omora Ethnobotanical Park: methodological approaches to broaden the ways of integrating the social component (“S”) in Long-Term Socio-Ecological Research (LTSER) sites. *Revista Chilena de Historia Natural* 83:27–68 [supplementary materials]
- Rozzi R, Armesto JJ, Gutiérrez J, Massardo F, Likens G, Anderson CB, Poole A, Moses K, Hargrove G, Mansilla A, Kennedy JH, Willson M, Jax K, Jones C, Callicott JB, Kalin MT (2012) Integrating ecology and environmental ethics: earth stewardship in the southern end of the Americas. *BioScience* 62(3):226–236
- Schaedel RP (1979) From homogenization to heterogenization in Lima, Peru. *Urb Anthropol* 8:399–420



- Schlesinger W (2013) *Biogeochemistry: an analysis of global change*, 3rd edn. Academic, Waltham
- Simberloff D, Von Holle MB (1999) Positive interactions of nonindigenous species: invasional meltdown? *Biol Invasions* 1:21–32
- Swanson FJ, Goodrich C, Moore KD (2008) Bridging boundaries: scientists, creative writers, and the long view of the forest. *Front Ecol Environ* 6:449–504
- Tacón A (1999) *Recolección de piñón y conservación de la Araucaria (Araucaria araucana, Mol. Koch.): Un estudio de caso en la comunidad de Quinquen*. Master thesis, Universidad Austral de Chile, Valdivia, Chile
- Taylor B (2010) *Dark green religion: nature spirituality and the planetary future*. University of California Press, Berkeley
- Tobasura I (2006) *Ambientalismos y Ambientalistas: El Ambientalismo Criollo a Finales del Siglo XX*. Universidad de Caldas, Manizales
- Touw M (1982) Roses in the middle ages. *Econ Bot* 36(1982):71–83
- UN-DESA (2011) *World urbanization prospects: the 2011 revision*. United Nations Department of Economic and Social Affairs – Population Division, New York
- Varela FJ, Thompson E, Rosch E (1995) *The embodied mind: cognitive science and human experiences*. MIT Press, Cambridge, MA