

The road to biocultural ethics

As a child, Ricardo Rozzi visited indigenous communities in the high Andes with his grandfather and was enchanted by their close relationship with the natural world. Later, he and his wife would return to the region to explore the traditional ecological knowledge of the world's southernmost indigenous people.

W*et-wet, chukao, pütriu-pütriu.* I have never forgotten these words uttered by the *lonko*, or chief, of the indigenous Mapuche community, who live in the forests of the high Chilean Andes. I was 5 years old when, in 1965, I accompanied my grandfather on one of his medical visits to indigenous communities in southern Chile. Before sunrise, our old Chevy truck had reached the end of the dirt road that winds its way up the lower slopes of the Lonquimay volcano. We hiked all day through the dense evergreen rainforests, listening to the loud bird calls that came from the forest interior, while my grandfather taught me the names and natural history of the birds. At sunset, we reached the high Andean zone. The landscape opened, and I was amazed by the view of the patches of 50-m-tall monkey-puzzle trees (*Araucaria araucana*), which resembled umbrellas in the middle of the lava soils around Lake Galletue, on the shores of which a community of Mapuche lived (Figure 1).

My grandfather explained to me that this particular Mapuche group called themselves Pewenche, “people (*che*) of the monkey-puzzle (*pewen*) tree”, and that their language is called *Mapudungun*, the “language (*dungun*) of the land (*mapu*)”, which imitates the local sounds of the forest. The monkey-puzzle trees were covered by flocks of loud parrots (*Enicognathus lephorhynchus*). Like the Mapuche, these birds eat the *ngilliu*, the large megagametophytes of the *pewen* cones. At night, huddled around the fire inside their huts, we ate toasted *ngilliu*. Some of the Mapuche drank a cider-like alcoholic drink distilled from *ngilliu*. I learned that the *pewen* cones were a vital food for the Mapuche, allowing them to survive the rigorous high Andean winters. While I listened to the conversations with the *lonko*, I was fascinated by the musicality of the spoken words and the remarkable similarity that the names of the birds had with the calls we had heard while crossing the forests. The affinity that this community had with the flora and fauna of the surrounding forest left a deep and lasting impression on me.

Thirty years later, in 1995, my wife – Francisca Massardo, a plant physiologist who collaborated with the Traditional Medicine Division of the Chilean Ministry of Health – and I participated in a scientific panel established by the Chilean National Commission of the Environment to evaluate the environmental impact assessment (EIA) of a dam that was going to be built across the Bio-Bio River (the largest river in Chile), the headwaters of which originate from Lake Galletue. The EIA included statements from communities in the Pewenche territory who demanded that the dam be built below the *pewen* forests, because these trees were critical to the life and health of their people. As part of the EIA evaluation, Francisca and I analyzed the nutritional value of the megagametophytes of the *pewen* cones, and discovered



Figure 1. In southern South America, the monkey-puzzle tree and the Magellanic woodpecker co-inhabit the land with the Pewenche and Yaghan communities, respectively.

that they were rich not only in starch but also in two essential amino acids, methionine and cysteine.

Our finding provided strong scientific support for the traditional ecological knowledge (TEK) of the Pewenche. From a medical perspective, the high amounts of methionine and cysteine in the megagametophytes represent a functional explanation for the Pewenche’s TEK, because the *pewen* trees provide a primary source of essential amino acids to the fauna that inhabit the volcanic ecosystems of the high Andes. From a biogeochemical perspective, given that methionine and cysteine are peculiar amino acids that contain sulfur, our analyses led to a scientific appreciation of the profound meaning of the names Mapuche and Pewenche: this culture knows that the *mapu* (the land, including the volcanoes) provides the nutrients (eg sulfur) for the trees and the people (Rozzi *et al.* 2008).

As an undergraduate student, I lamented that the TEK of the Mapuche and other Amerindian peoples was not incorporated into the ecology programs taught at Chilean universities. This motivated me to study philosophy, which helped me to understand “pluriverse” epistemologies and diverse forms of ecological knowledge, in contrast to the “universal” approach of science teaching that prevailed within Chilean academia in the 1980s. Under the dictatorship of General Augusto Pinochet, the teaching of philosophy – including the philosophy of science – was completely suppressed between 1973 and 1981, and was only rudimentarily reintroduced in Chilean universities later during the 1980s. For this reason, when I applied to do graduate work at the University of Connecticut, I proposed to combine my PhD in ecology

with an MA in philosophy, and to focus my research on the ornithological knowledge of the world's southernmost indigenous people: the Fuegian Yahgans.

Together with our academic advisors and a group of researchers and students, Francisca and I travelled to Cape Horn to meet “the grandmothers”, Úrsula and Cristina Calderón, the last two Yahgan who spoke their native language fluently (Figure 2). We were amazed by the region's exuberant evergreen forests – we expected to find tundra at the southern end of the Americas – and by the detailed knowledge and familiar relationship that Úrsula and Cristina had with the local birds in their everyday life, both materially and symbolically. Úrsula's favorite bird was *lana*, the giant Magellanic woodpecker (*Campophilus magellanicus*; Figure 1), a close relative of the North American ivory-billed woodpecker. She explained to us that, in Yahgan, “lan” means “tongue”, and the bird's name alludes to the long tongue with which it skillfully extracts larvae from trees. The scientific name also highlights these attributes: *Campophilus* means “caterpillar-lover”. These birds are so specialized in their habitat requirements that they feed and nest solely in old-growth southern beech trees (*Nothofagus* spp).

The Mapuche and Yahgan TEK demonstrates, as much as does our scientific ecological knowledge, a clear understanding that the well-being of humans and other species goes hand in hand. A similar understanding can also be found in the early beginnings of Western science and ethics. Indeed, the English word “ethics” originates from the Greek term “*ethos*”, which, in its more archaic form, meant a “den” (the dwelling of an animal; Rozzi *et al.* 2008). Our field experience in Cape Horn extended the central question of ethics – about the concept of the good life and how we should live – into the broader biocultural question of *how to co-inhabit* with human and other-than-human beings.

This biocultural understanding stimulated us to further investigate the ancient Amerindian, Western philosophical, and contemporary concepts of ecological knowledge and ethics, and to take action to contribute to the conservation of this precious biological, linguistic, and cultural diversity.

Along with a group of scientists, artists, philosophers, and other professionals, both Chilean and foreign, we initiated a program of field environmental philosophy and biocultural conservation that led to the creation of the Omora Ethnobotanical Park in 1999. In the Yahgan language, “*omora*” is the name of the firecrown hummingbird (*Sephanoides sephanioides*), and in the ancient narratives it is presented as a powerful small man and spirit who maintains both ecological and social order. *Omora* became a flagship species, and with members of the indigenous community, the regional government, researchers, and students, we launched a research, education, and conservation program that resulted in the creation of the UNESCO Cape Horn Biosphere Reserve in June 2005 (Rozzi *et al.* 2006). The Omora Ethnobotanical Park became the transdisciplinary research center of the new biosphere reserve, and in 2005 we inaugurated the Sub-Antarctic Biocultural Conservation Program, in partnership with the University of Magallanes,



Figure 2. Úrsula Calderón and Ricardo Rozzi during a recording session on Cape Horn.

the Institute of Ecology and Biodiversity, and the University of North Texas (www.chile.unt.edu).

In current times, human-driven global change demands not only more scientific knowledge but also a sense of environmental ethics. Diverse forms of ecological knowledge and ethics inform one another; they do not constitute autonomous facts and values (Rozzi 1999). The biocultural understanding of ancient Western philosophy, Amerindian TEK, and ecological sciences offers a viable conceptual platform to orient ethically and scientifically informed answers to the call for Earth stewardship proposed by the Ecological Society of America in its forthcoming 96th Annual Meeting in 2011 (Chapin *et al.* 2010). A greater appreciation of the biocultural mosaic within global educational, administrative, and economic systems that currently prevail can foster policies that favor the continuity of regional sustainable cultures, and could also provide a foundation for a global, heterogeneous meta-culture of sustainable co-inhabitation.

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