The Plant Pioneers of the Strait of Magellan

Thousands of years ago, the Strait of Magellan was not what we know now, but rather an ice field. Thanks to the deglaciation, large lakes originated and the soils were covered with the pioneering organisms of the place: liquids, bryophytes and fungi. In this article, scientists Laura Sánchez-Jardón, Bernard Goffinet, Ricardo Rozzi and photographer Felipe Soza describe some of the representatives of these pioneers from the region where they were made in the Strait of Magellan.

Twenty thousand years ago the Strait of Magellan was not such, but a vast field of ice. During the deglaciation started some sixteen thousand years ago, the retreat of the ice in its central part and surrounding areas gave rise to large lakes and terrestrial ecosystems whose rocks and soils were progressively covered by pioneering organisms: lichens, bryophytes and fungi.

This first discovery of the Strait of Magellan, associated with the melting of the ice cover, was producing unique processes of ecological succession led by small colonizing organisms, plant pioneers that generated the first ecosystems with a unique biota whose exuberance at the "end of the world" it is greater than in any other region of the planet.

When Hernando de Magallanes arrived at the southern tip of America five hundred years ago, there was a second discovery of the biota of the strait that today bears his name. The promise of riches offered by the New World, Terra Incognita, motivated scientists to explore the region, who were surprised by the abundance and diversity of lichens, mosses and fungi that grew on the ground and the trunks of subantarctic forests.

Some of these unique species are *Ganoderma australe*, which grows on coigües, lengas and ñires and is striking for its tongue or ear shape; in fact, they are known as "stick ears"; *Cortinarius magellanicus*, whose surprising color (bright purple) awakens the imaginations of scientists, tourists, and various Magellan co-inhabitants; some are even associated with algae and form lichens: *Peltigera patagonica*, one of the few species that appears on the tree line in the upper part of the mountain range and whose endemic distribution in the subantarctic region makes this species characteristic of it; *Protousnea magellanica* or "old man's beard", as this lichen is commonly called, abundant and widely distributed in subantarctic forests; along with *Pseudocyphellaria berberina*, they are endemic to the Southern Cone of South America.

In February 1834, Charles Darwin continued his navigation through the strait towards Puerto del Hambre aboard the Beagle, exploring the Shoal cove sector along the way. The British noted that this landscape represents a transition zone between aridity and humidity, between

«Patagonia and Tierra del Fuego; many plants from these regions grow here ». The next day they arrived in Puerto del Hambre and on February 6 of that year, the young naturalist made his memorable ascent to Mount Tarn, recording in his Diary:

I found a second species in other beech species in Chile; and Dr. Hooker informs me that a third species has recently been discovered in Van Diemen's Land [Tasmania]. How unique is this relationship between parasitic fungi and the trees on which they grow, in the farthest parts of the world! In Tierra del Fuego, the fungus in its smooth and mature state is collected in large quantities by women and children, and is eaten without cooking.

The young naturalist was referring here to the digueñes or dihueñes (*Cyttaria* spp.), Also recognized in other scientific expeditions by the southern hemisphere during the 19th century. These endemic fungi, metaphorically called "Indian bread", that grew on the trunks and branches of the coigüe and lenga, both trees of the dominant *Nothofagus* genus in the region, were already discovered by the first human populations that reached the strait and other areas from the Magellan subantarctic ecoregion, who found in them a unique food source.

Indeed, little by little, the extreme richness of fungi was revealed, as well as the exceptional diversity of small plants in the sub-Antarctic region of the Strait of Magellan: mosses, liverworts and hornworts, which together are called bryophytes. These small organisms facilitated the recolonization of life once the ice was removed in the Strait of Magellan, sheltering in the neighboring territories the original peoples that arrived more than ten thousand years ago.

Just twenty years ago, a third discovery of the Magallanes region south of the strait, in the Cape Horn archipelagos, happened fortuitously, leading to the identification of this sub-Antarctic region as a world center of diversity of bryophytes and lichens. The unique biodiversity that inhabits these archipelagos is of great value for life on the planet and we must jointly take care of this biota and ecosystems that contribute to planetary health.

Among these species are the *Dendroligotrichum dendroides* or "pinito moss", with the appearance of a miniature tree - up to 20 centimeters the largest -; *Bartramia mossmaniana*; *Sphagnum magellanicum*, an endemic species of the southern hemisphere that proliferates locally on accumulations of dead organic matter, forming a particular type of ecosystem called «peatland», extraordinarily important in carbon fixation and in the retention of water and nutrients; in especially humid and shady places are also found hornwort like *Phaeomegaceros chiloensis*.

These miniature forests of fungi, lichens and bryophytes, in addition to all the associated fauna of invertebrates, have accompanied the three discoveries of the Strait of Magellan. From an ethical point of view, they can be considered as Magellanic co-inhabitants: literally, they have shared the habitats of the strait with humans since the first settlement and have had a leading role in their food, health, fire source, water, culture and , lately, in the scientific vanguard. From the south of the world, the knowledge of the great Magellanic flora will contribute to its conservation and the sustainability of the planet in the scenario of global socio-environmental change.

About the authors: Laura Sanchez-Jardón, is a Doctor in ecology and environment at the Complutense University of Madrid; Ricardo Rozzi is a Doctor in Ecology and a Master in Philosophy from the University of Connecticut; Bernard Goffinet is a Doctor in Botany University of Connecticut and Jorge Felipe Soza Soza (Instagram: @felipesozaphotography)