

Pastures and humans drip-fed by glaciers

In the tropical Andes, downstream of glaciers, a unique ecosystem, vital for local communities, is endangered by climate change. Thanks to satellite images, combined with field data, long-term projections can be carried out.



Grazing alpacas in *bofedales*, Bolivia.

2012: in the Bolivian highlands, researchers were studying a potato pest moth, when they heard about *bofedales*, verdant oases which follow streams and contrast with the arid landscapes of the region. These little known ecosystems are less complex than those located further downstream, as they are dominated by a plant species, which could help model their interaction with the physical environment, notably rainfall and glaciers.

This is how researchers began to work on *bofedales*. It appeared that these ecosystems were vital for local populations, who graze their cattle there. Predicting how they will change, against the backdrop of climate change, is therefore a major issue for the region. This is why researchers decided to piece together their recent developments, through close interactions with water and therefore the glaciers rising above them. These glaciers have been monitored by scientists for thirty years.

By cross-referencing field data with satellite images, researchers found a link between the surface area of the 1,700 *bofedales* studied and the melting of glaciers observed since the late 1970s. *Bofedales* located near glaciers are supplied with water throughout the year, even in the

... Data models are helping us to understand the connections between glaciers and *bofedales* ...



Biodiversity study, Bolivia.

dry season, and are therefore doing particularly well. They are larger and can withstand high grazing pressure.

This “state of grace” will come to an end once glaciers are gone. The absence of water during the dry season should reduce the surface area of *bofedales*, which may no longer be able to withstand grazing. This warning signal was received by local populations, who are already testing protection strategies, by restricting access to certain *bofedales* during the rainy season or attempting to retain water via a variety of processes.

PARTNERS

Pontificia Universidad Católica del Ecuador, Ecuador

Universidad Mayor de San Andrés, Bolivia



BIODIVERSITY IN THE GLOBAL SOUTH

Research
for a sustainable world

IRD Éditions

INSTITUT DE RECHERCHE POUR LE DÉVELOPPEMENT
FRENCH RESEARCH INSTITUTE FOR SUSTAINABLE DEVELOPMENT

Marseille, 2020

Written by

Viviane Thivent/Les Transméduses

Editorial coordination

Corinne Lavagne

Design and page layout

Charlotte Devanz

The photos in this publication come from the Indigo image bank (IRD),
unless otherwise specified

Cover photo

Swim At The Lake - Henri Robert Brésil

By courtesy of www.naderhaitianart.com

As the law of 1st July 1992 (intellectual property code, part one), pursuant to paragraphs 2 and 3 of article L. 122-5, only authorises, on the one hand, "copies or reproductions reserved strictly for the private use of the copyist and not intended for collective use" and, on the other hand, "analyses and short quotations in a purpose of example and illustration", any representation or complete or partial reproduction, made without the approval of the author or their successors or legal claimants, is prohibited (paragraph 1 of article L. 122-4). Such representation or reproduction, by whatever process, would therefore constitute counterfeit punishable under title III of the above law.

© IRD, 2020

ISBN print : 978-2-7099-2874-8

ISBN PDF : 978-2-7099-2875-5

LIST OF SCIENTIFIC CONTRIBUTORS

New tools for studying biodiversity

Swimming in a stream of information

Anne-Elisabeth Laques, landscape geographer, UMR Espace-Dev
Stéphanie Carrière, ethno-ecologist, UMR Gred
Danielle Mitja, ecologist, UMR Espace-Dev
Pierre Couteron, ecologist, UMR Amap
Éric Delaitre, specialist in the use of remote sensors for terrestrial analysis, UMR Espace-Dev

Artificial intelligence to the rescue for biodiversity

Morgan Mangeas, mathematician specialising in artificial intelligence, UMR Entropie
Corina Iovan, specialist in remote sensing and artificial intelligence, UMR Entropie
Laurent Vigliola, marine biologist, UMR Entropie

The Nagoya protocol, reconciling ambition with effective action

Jean-Louis Pham, plant geneticist, Nagoya scientific advisor, UMR Diade

Listening to the environment

Amandine Gasc, eco-acoustician, UMR IMBE

A botanist in my smartphone

Jean-François Molino, ecologist, UMR Amap

Using genetics to identify the adaptive capacities of coral

Véronique Berteaux-Lecellier, geneticist, UMR Entropie
Gaël Lecellier, geneticist, UMR Entropie
Oliver Selmoni, geographer, UMR Entropie and EPFL
Stéphane Joost, geographer, EPFL

Protecting biodiversity

Converting waste water into fertiliser for leafier cities

Didier Orange, eco-hydrologist, UMR Eco&Sols

Of dams and fish

Pablo Tedesco, biologist, specialist in aquatic ecology, UMR EDB

Cataloguing the French Guiana forest

Raphaël Pélissier, ecologist, UMR Amap

Birds and tourists as research topics

Martin Thibault, ecologist and population biologist, UMR Entropie
Philippe Borsa, population geneticist, UMR Entropie
Catherine Sabinot, ethnoecologist and anthropologist, UMR Espace-Dev
Éric Vidal, ecologist and population biologist, UMR Entropie

Making sure that regulation rhymes with appropriation

Catherine Sabinot, ethnoecologist and anthropologist, UMR Espace-Dev
Jean-Brice Herrenschmidt, geographer, GIE Oceanide, UMR Espace-Dev
Gilbert David, geographer, UMR Espace-Dev
Fabrice Brescia, ecologist, Institut Agronomique Néo-Calédonien (IAC), Arboreal team

The proportion of birds

Philippe Cury, marine ecologist, UMR Marbec

Biodiversity and health

Nature's abundance protects us against pandemics

Benjamin Roche, biologist, specialist in the ecology of pathogenic agents and health threats, UMR Ummisco and Mivegec

At the cutting edge of ethnopharmacology

Geneviève Bourdy, ethnopharmacologist, UMR Pharma-Dev
Christian Moretti, ethnopharmacologist, UMR EIO, retraité

Tracking infectious diseases

Oleg Mediannikov, microbiologist, expert in infectious diseases, UMR Mephi

Controlling the inevitable

Laurent Granjon, biologist, UMR CBGP

Biodiversity to feed the world

Trees, the backbone of agriculture

Geneviève Michon, ethnobotanist, UMR Gred

Moving towards sustainable aquaculture

Marc Legendre, fish physiologist, UMR Isem

Adaptive fishing in Peru

Arnaud Bertrand, marine ecologist, UMR Marbec

Pastures and humans drip-fed by glaciers

Olivier Dangles, ecologist, UMR Cefe

Custodians of agricultural diversity

Serge Hamon, plant breeder, UMR Diade
Yves Vigouroux, population genomicist, UMR Diade

Rice as a common good

Alain Ghesquières, geneticist, UMR Diade

The potential of the world beneath our feet

Alain Brauman, soil ecologist, UMR Eco&Sols
Éric Blanchart, soil ecologist, UMR Eco&Sols

Mangroves, a new Eldorado?

Marie-Christine Cormier-Salem, geographer, UMR Paloc

Plant symbiosis

Éric Giraud, microbiologist, UMR LSTM

The Hidden Agriculture of the Amazon Forest

Laure Emperaire, ethnobotanist, UMR Paloc