

ICIMOD

29-30 SEPTEMBER 2021

**Invasive alien species
in the Hindu Kush
Himalaya**

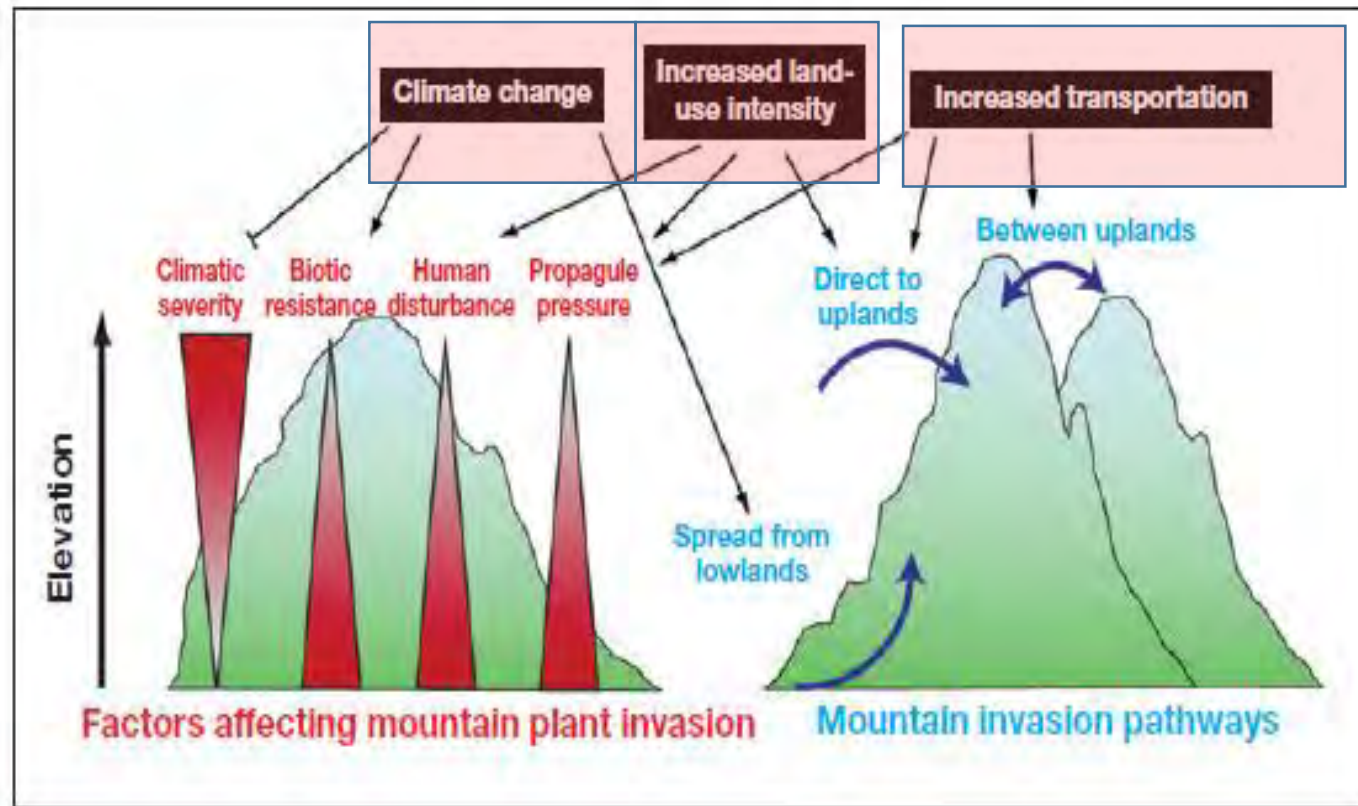
Setting management
targets for the next decade

Plant invasion in mountains around
the world: Current status and
MIREN's collaborative research

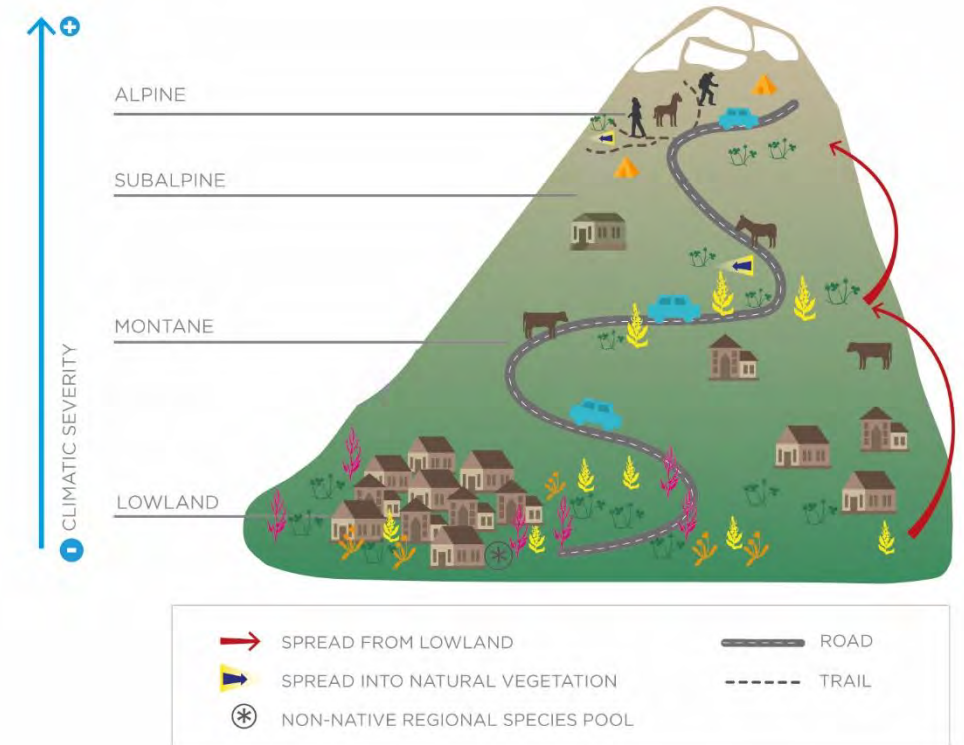
Agustina Barros
on behalf of MIREN Steering Committee & Members



Why research on mountain plant invasions is important?



Pauchard et al. 2009. *Frontiers in Ecology and the Environment*



Barros et al. under review



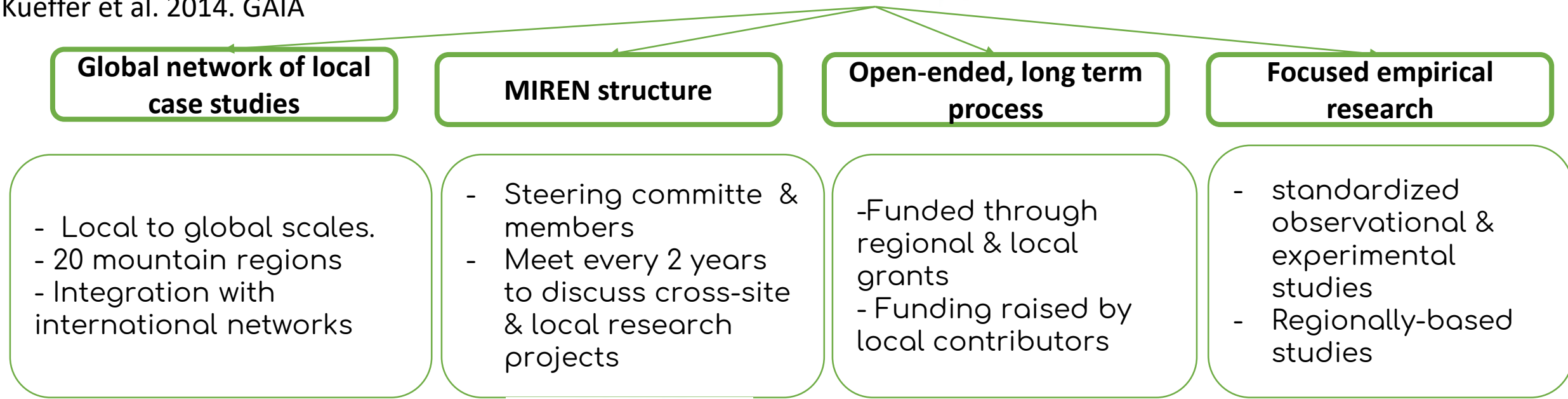
What is MIREN?

- collaborative research network that aims to understand the effects of global change on species distribution and biodiversity on mountains

<https://www.mountaininvasions.org/>



Kueffer et al. 2014. GAIA



Global network of local case studies

- Local to global scales.
- 20 mountain regions
- Integration with international networks

MIREN structure

- Steering committee & members
- Meet every 2 years to discuss cross-site & local research projects

Open-ended, long term process

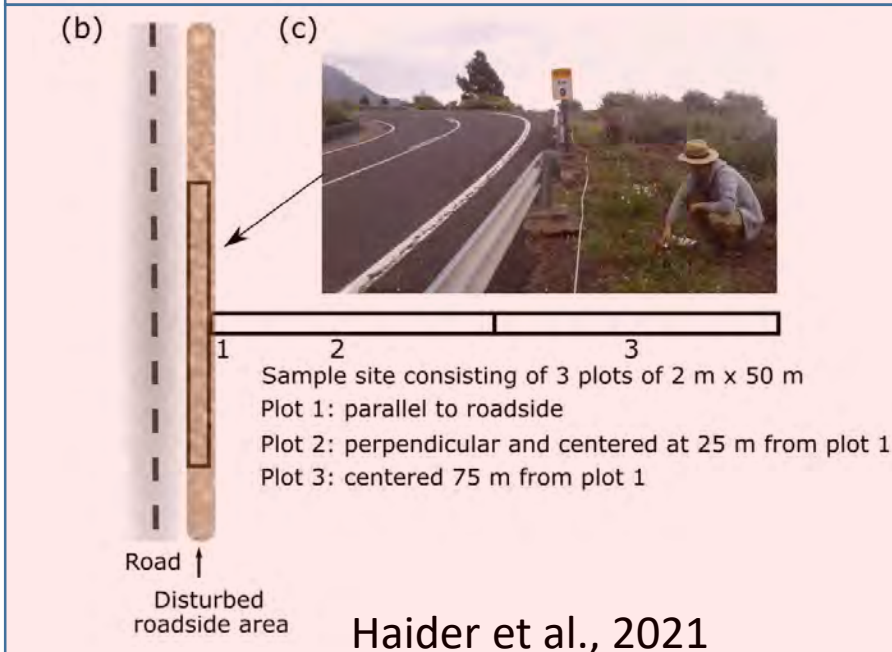
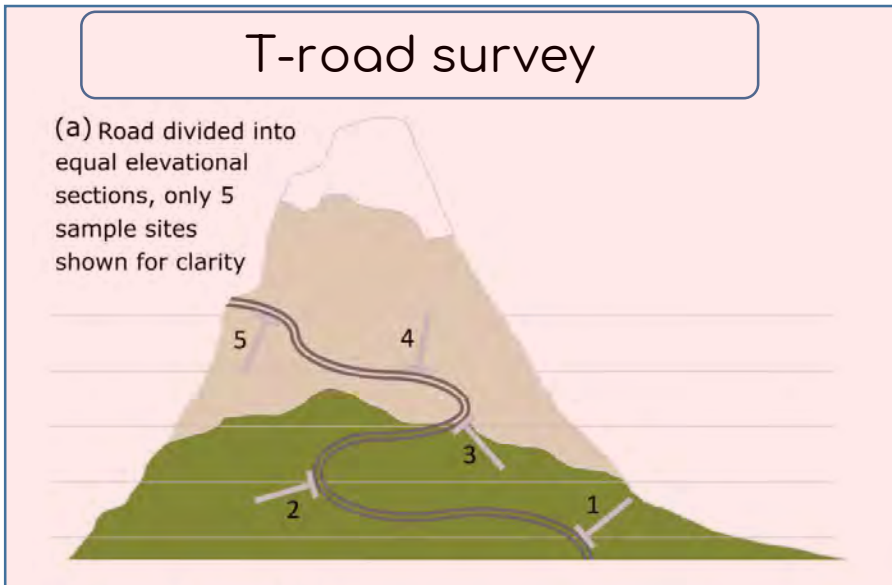
- Funded through regional & local grants
- Funding raised by local contributors

Focused empirical research

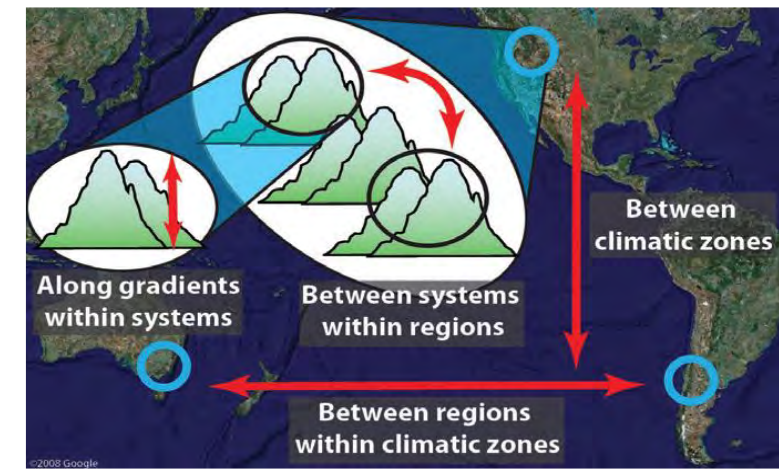
- standardized observational & experimental studies
- Regionally-based studies



Miren observational studies



Hierarchical approach
(Pauchard et al. 2009)



- Monitor plant communities & changes in sp. distribution
- Assess interactive effects of climate change & human disturbance
- ✓ Undertaken by local teams
- ✓ 3 roads per region
- ✓ 20 transects per road at equal elevation intervals
- ✓ 3 plots (2 x 50 m)
- ✓ species occurrence, cover & abundance
- ✓ level of disturbance (human and natural)
- ✓ habitat types
- ✓ repeated every 5 yrs

Rocky mountains



@Tim Seipel

Tenerife



Northern Scandes



@Jonas Lembrechts

Kroknose



@Jonas Lembrechts

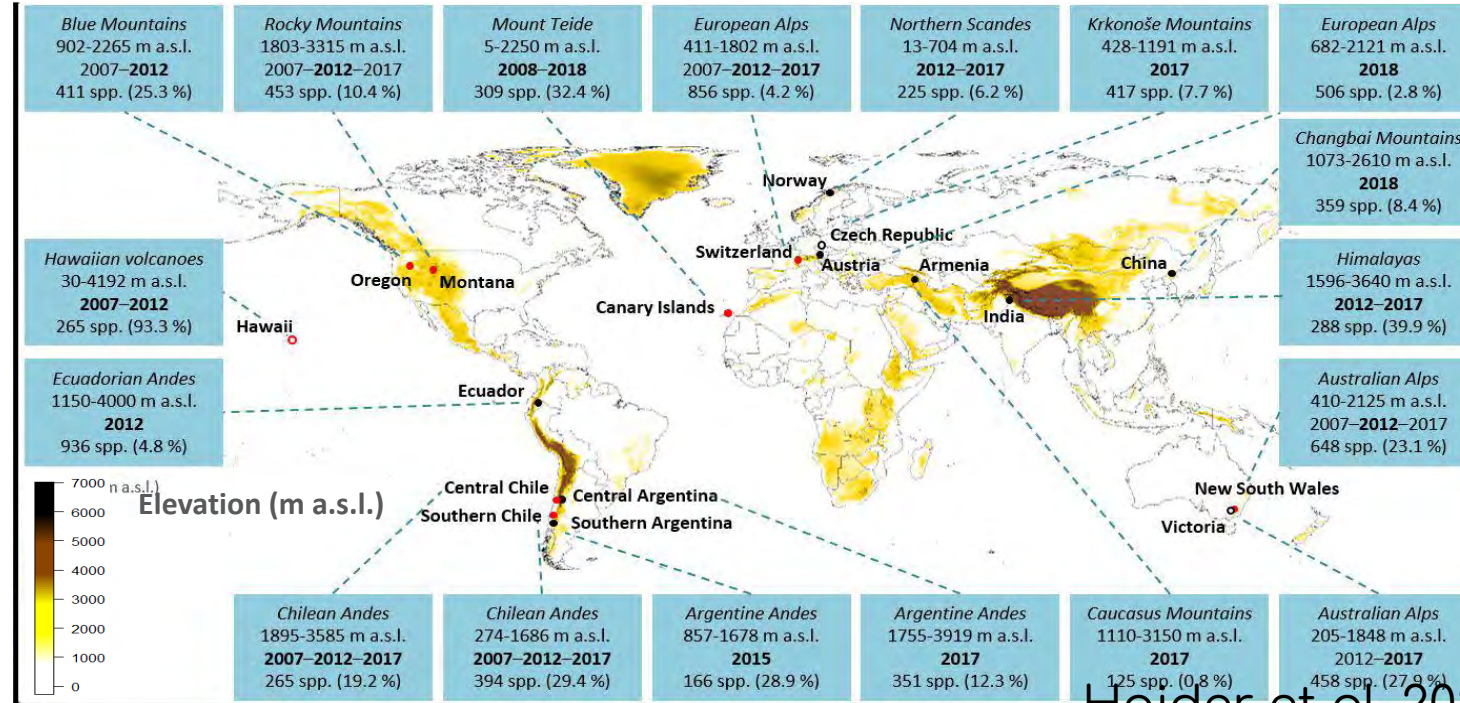
Ecuadorian Andes



South Andes Chile



@Jonas Lembrechts



Haider et al. 2021

Changbai



Australian Alps



Central Andes Argentina



Rocky mountains



Tenerife



Northern Scandes



Krkonoše



Ecuadorian Andes



- ✓ 57 mountain roads
- ✓ 18 regions
- ✓ 1750 meters



- ✓ 610 non-native species recorded
- ✓ ~ 24 species countries Europe
- ✓ ~ 247 Hawaii

Haider et al. 2021

Changbai



Australian Alps

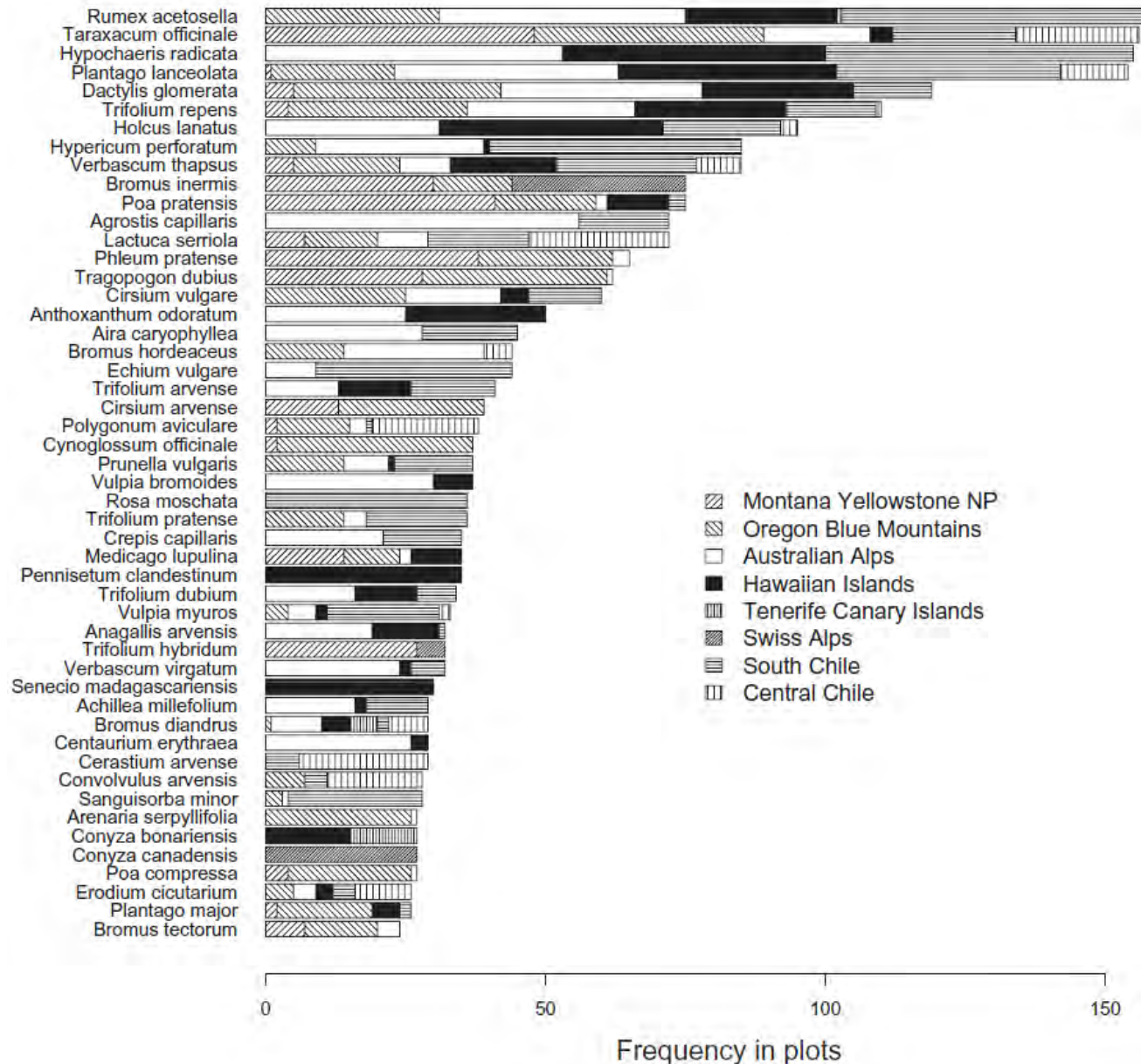


South Andes Chile



Central Andes Argentina

Non-native invaders



Common



Regional invasive



Kashmir & Australia



Argentina



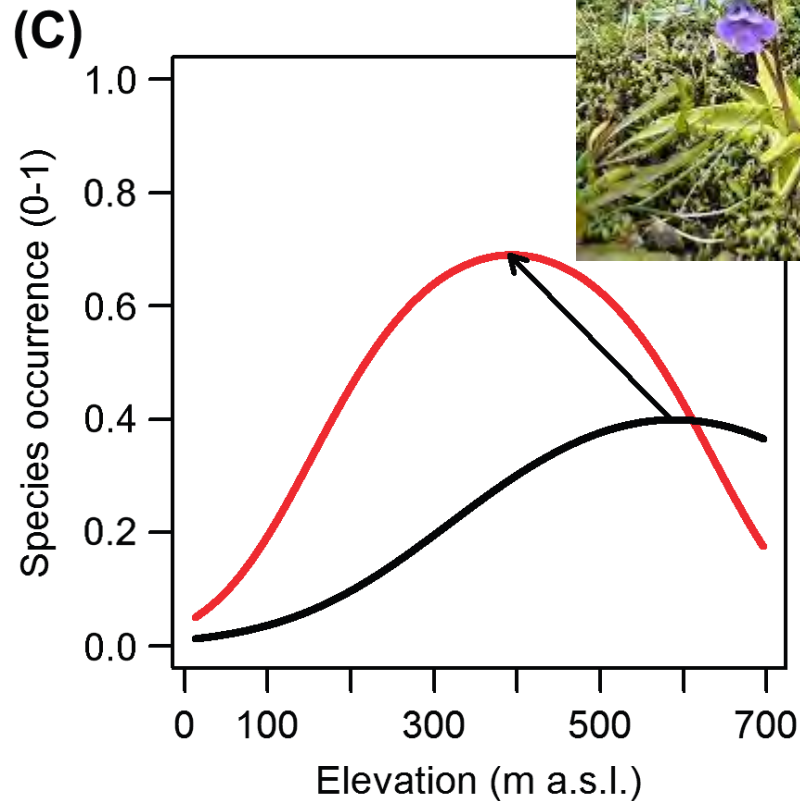
Chile

Roadside effects

Roads as drivers of range changes

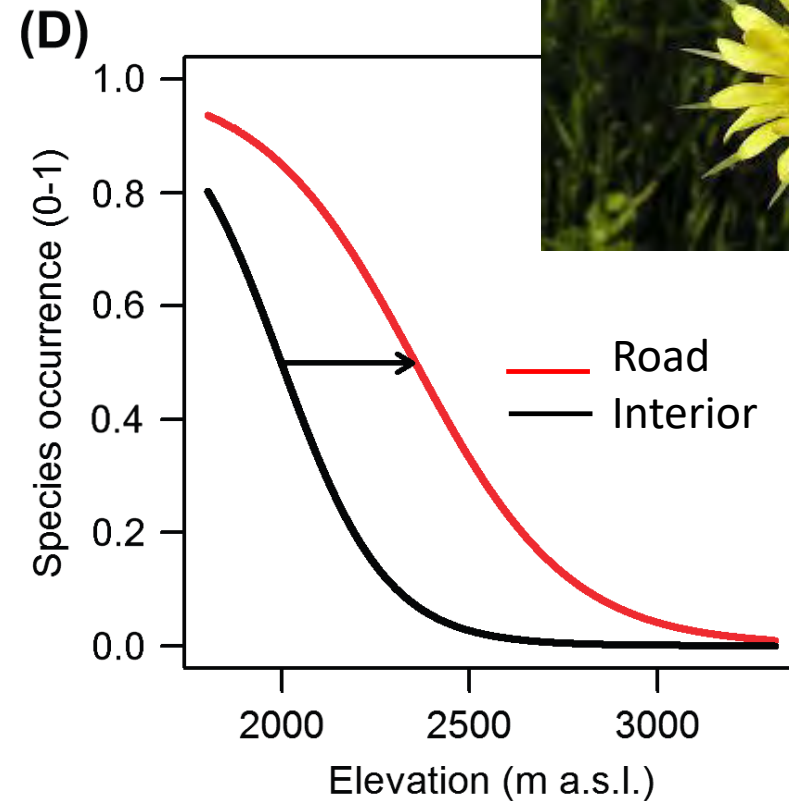
Pinguicula vulgaris
(Norway, native)

Downward shift



Tragopogon dubius
(non native, Montana)

Upward shift



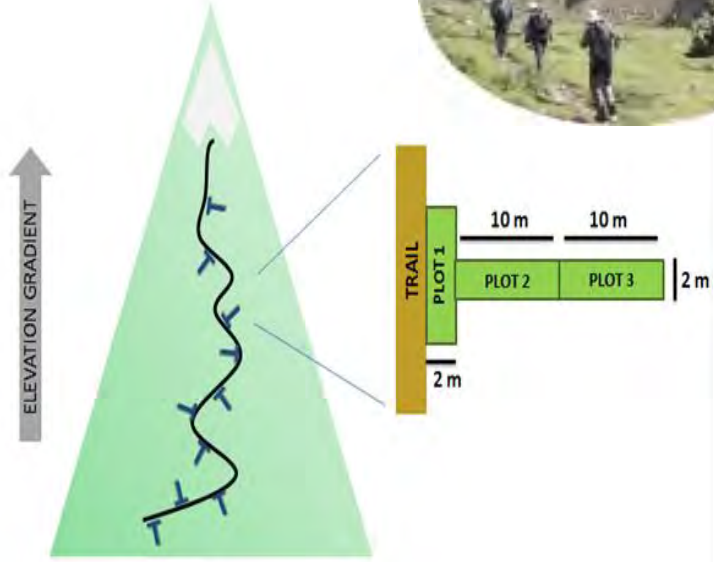
Add on projects

MIREN T-trail survey



Patterns of plant diversity & invasions on trails along elevation

(Coord. :Jonas Lembrechts, Anibal Pauchard, Agustina Barros)



- 8 regions in 3 continents (Asia, North & South America, Europe)
- 47 trails

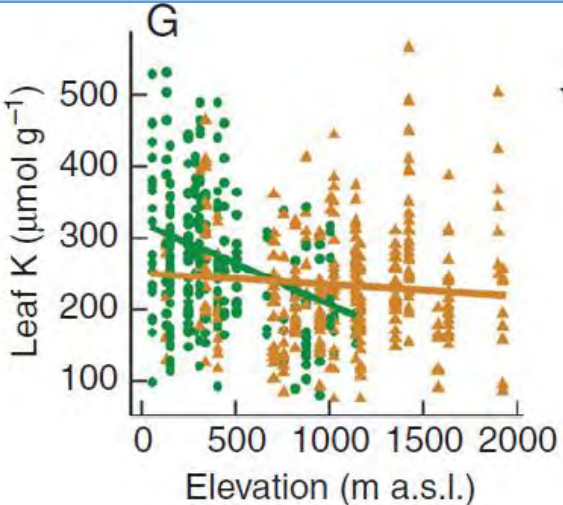
Plant traits



Trait variation along elevation gradients
(Coord. :Sylvia Haider)



Conservative vs. acquisitive strategies



Kühn, et al. 2021. *Annals of botany* 127, 565-576.

Add on projects

Global soil temp database



- > 8,000 sensors
- 51 countries
- from 2000 onwards



Lembrechts, et al. 2020. *Global change biology* 26, 6616-6629

Lembrechts et al., 2021. EcoEvoRxiv. DOI: [10.32942/osf.io/pksqw](https://doi.org/10.32942/osf.io/pksqw)

improved understanding of microclimate in mountains
(Coord.: Jonas Lembrechts)

Standardized comparative experiments



Disentangle different drivers of plant invasions



Removal & transplant

Disturbance is the key to plant invasions in cold environments

Jonas J. Lembrechts^{a,1}, Anibal Pauchard^{b,c}, Jonathan Lenoir^d, Martin A. Nuñez^e, Charly Geron^f, Arne Ven^g, Pablo Bravo-Monasterio^b, Ernesto Teneb^g, Ivan Nijs^a, and Ann Milbau^h

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PNAS

Recent funded projects



Range X “Mechanisms underlying the *success and impacts* on biodiversity and ecosystem functioning of *range-expanding species* under climate change”
(Jake Alexander, coordinator)



Processes behind range shifts

Impacts of range expanders

Prediction range expander & impacts

Synthesis & policy interphase

Detailed experimental & comparative studies within MIREN network

e.g. Novel plant removal as a management tool

Switzerland, South Africa, Norway, Australia, Chile, Kashmir, Montana

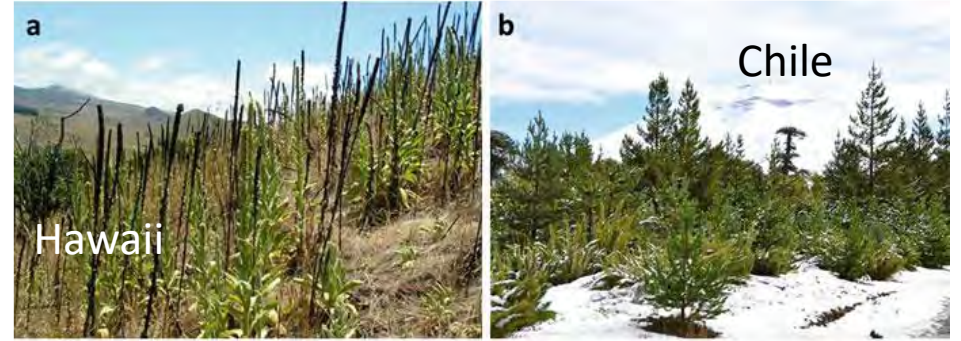
Support to management

- Assembling knowledge on mountain plant invasions & preventative actions (Kueffer et al. 2013, McDougall et al., 2011)



Regional differences in management
-sporadic control Chile (e.g. pines) vs.
active management Australia (e.g.
Hawckweed)

Management if threat is recognized
- Low Europe
- Insufficient information about the threat (e.g.
Chile) (McDougall et al. 2011)



Volunteers & sniffer dogs locate and erradicate every plant



BioOne RESEARCH EVOLVED

Plant Invasions in Mountains: Global Lessons for Better Management

Author(s) :Keith L. McDougall, Anzar A. Khuroo, Lloyd L. Loope, Catherine G. Parks, Anibal Pauchard, Zafar A. Reshi, Ian Rushworth, and Christoph Kueffer

Concluding remarks

- Growing network of great success (8 regions in 2007 to 20 regions in 2021)
- Link local to global scales to address important ecological & management questions related to mountain plant invasions
 - > 68 scientific publications since its foundation in 2005
- The global database with > 2,700 plots & >100,000 observations (Haider et al. 2021) allow us to:
 - contribute in the development of risk assessments of invasive plants
 - support the development of management guidelines to prevent plant invasions
 - provide a policy-science interfase



Thanks!!!



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