



BambApp: a citizen science project for the re-evaluation of the invasive potential of bamboo species in North-West Italy

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With the contribution of  **Fondazione CRT**



Thursday 8th, 2021

Bamboo species are a large subfamily of grasses with countless applications for their versatility of uses and the utilization of all plant parts

timber of good quality
and resistance

construction



other commercial purposes



- leaves for fodder
- shoots as human food
- stems for biomass
- musical instruments
- applications in cosmetics
- production of paper
- ornamental plants

INTRODUCTION

During the XIX century, several **bamboo** species were **moved outside their native ranges** (especially from Asia) and **imported worldwide**



Many **bamboos** are nowadays **naturalized**



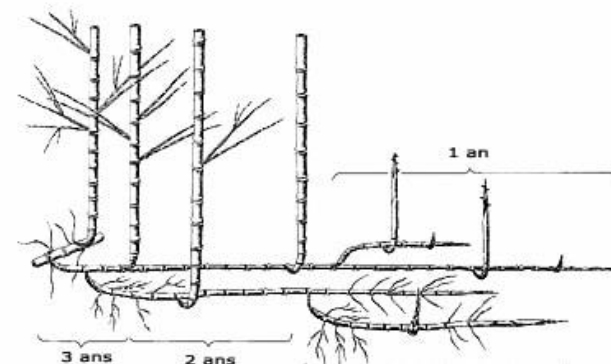
Expansion in the areas immediately surrounding their initial plantation sites



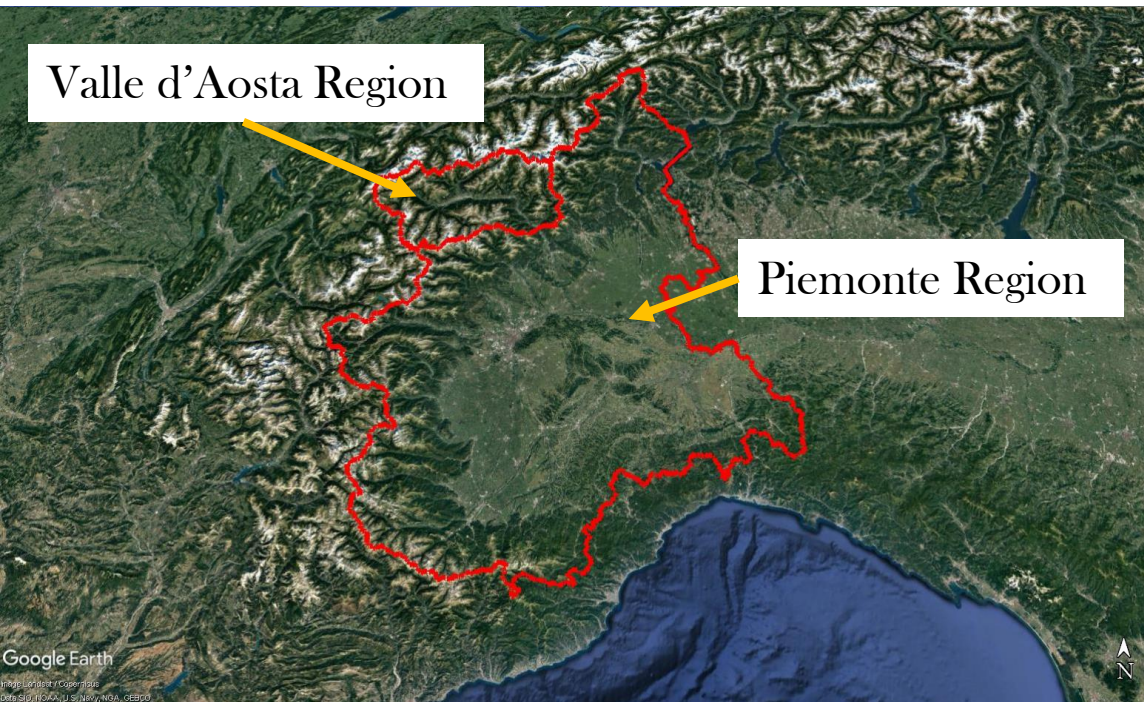
Negative impact on different types of **agricultural** and **semi-natural habitats**.



Public authorities responsible for the protection of environment and biodiversity express a **precautionary attitude for bamboos**, considering the invasive potential of the species.



Study Area



Valle d'Aosta Region	3.260,90 km ²
Piemonte Region	25.387,07 km ²
	<hr/>
	28.647,97 km ² TOTAL

The **list of naturalized bamboo species** and the relative covered area are rather **limited in NW Italy**.

Difficulties in the **identification** of bamboo species




LIMIT FOR THE DEFINITION AND THE APPLICATION OF CONTROL STRATEGIES OF POTENTIALLY INVASIVE SPECIES.

Main objective

‘BambApp’ project was developed to **provide reliable and comprehensive information** useful to public authorities for the **evaluation** of the **invasive potential** and for the **regulation of commerce** of bamboo species in NW Italy.

Specific objectives

- 1) **identify** as many naturalized **bamboo species** as possible currently **spread** in **NW Italy**
 - 2) characterize **morphological traits**
 - 3) describe which habitats surround each species
- 

Involvement of citizen scientists



<https://bambapp.weebly.com/>



Data collection

Mid-December 2017

Mid-October 2018

ONLY CLUMPS IN NATURAL CONDITIONS

4 pictures

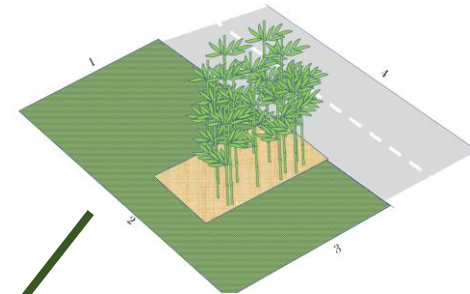


- culm basis
- intermediate node
- the leaves
- entire clump

Clump description

- Maximum clump height
- Maximum stem diameter
- Clump size

Description of the habitat types bordering on the four sides




Leaf specimens



herbarium sample



 **iNaturalist**

 BambApp

Citizen science project



This app is an international social networking resource that allows users to browse and post observations, photos, videos and findings about plants, animals and the natural world around them (Matheson, 2014)

A screenshot of the iNaturalist website interface. The top navigation bar includes the iNaturalist logo, a search bar, and links for "Explore", "Your Observations", "Community", "Identify", and "More". A green "Upload" button is in the top right. The main content area features a "BambApp" project card with a bamboo icon, circled in red. Below the card is a "Stats" section with a "Totals" header and three rows of data: "949 Observations", "4 Species", and "46 People". To the right is a map of Italy with a red heatmap overlay and green location pins, primarily concentrated in the northern and central regions. The map includes labels for cities like Milano, Genova, and Asti, and national parks like "Parco nazionale della Vanoise".

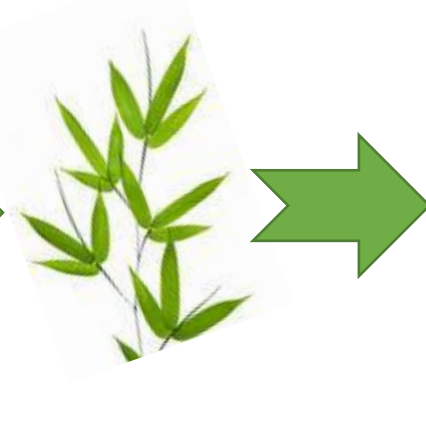
Identification of bamboo species



Identification based on morphological characters visible all year round



Identification based on morphological characters visible all year round



DNA BARCODING

RAPD-PCR

FEM2 Ambiente - Milano



FEM2-AMBIENTE
SPIN-OFF ACCREDITATA
DALL'UNIVERSITA'
DEGLI STUDI DI
MILANO-BICOCCA

Data analyses

1 Descriptive statistics

- Abundance of each identified species
- Elevation distribution
- Clump height
- Clump size
- Stem diameter

3 Evaluation of the invasive potential

Principal Component Analysis (PCA) using the variables related to population growth performance



- Maximum clump height
- Maximum stem diameter
- Clump size

2 Distribution map for each species

4 Characterization of habitat distribution

habitats reported by volunteers were pooled into three categories:

- ANTHROPOGENIC** (i.e. roads, railways, buildings, parking areas, walls, private gardens, vegetable gardens, ditches, orchards, etc.)
- AGRICULTURAL** (i.e. arable, mown meadows, pastures, poplars, etc.),
- NATURAL** (i.e. with a dominance of woody species such as forests, riparian areas, ponds, natural shrublands, etc.)

Citizen scientists and data collected



33 users

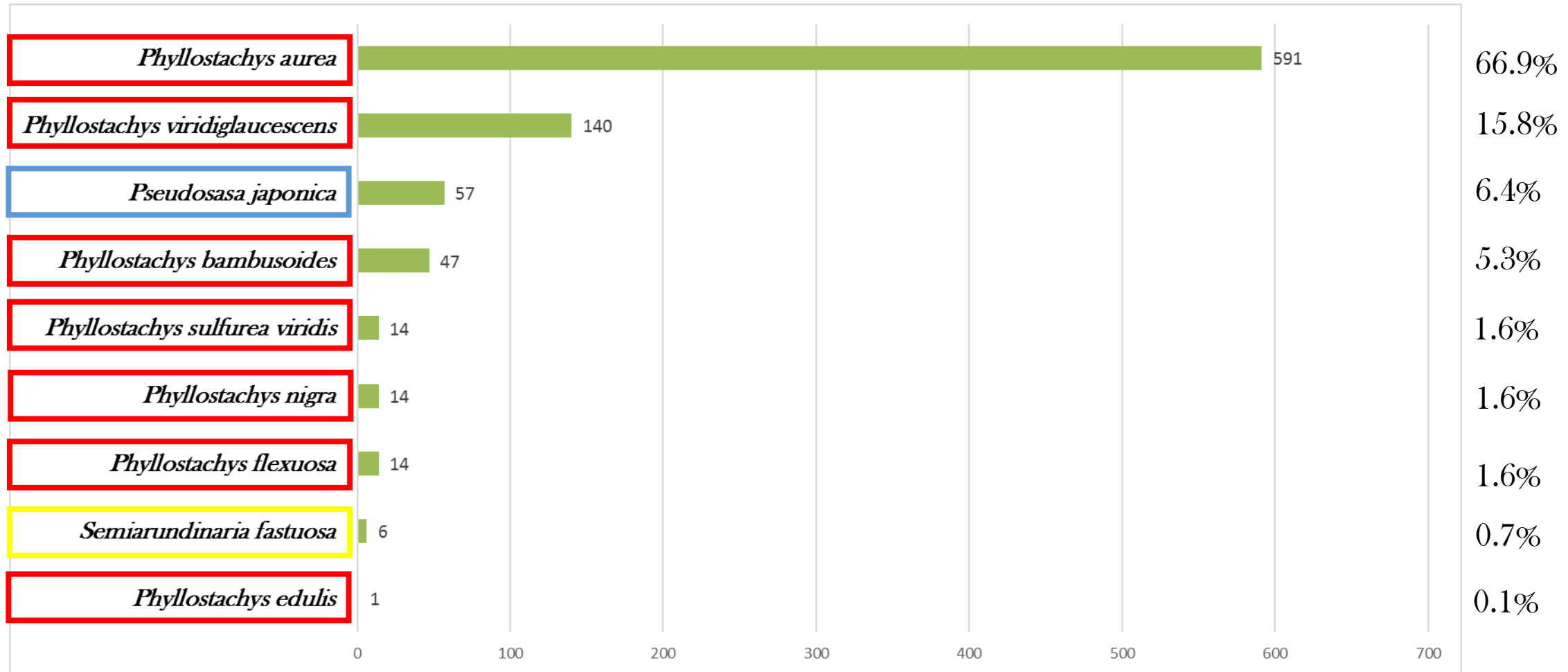


4053 pictures



926 samples

Bamboo species



Bamboo species



Con il contributo di
Fondazione CRT

BambApp

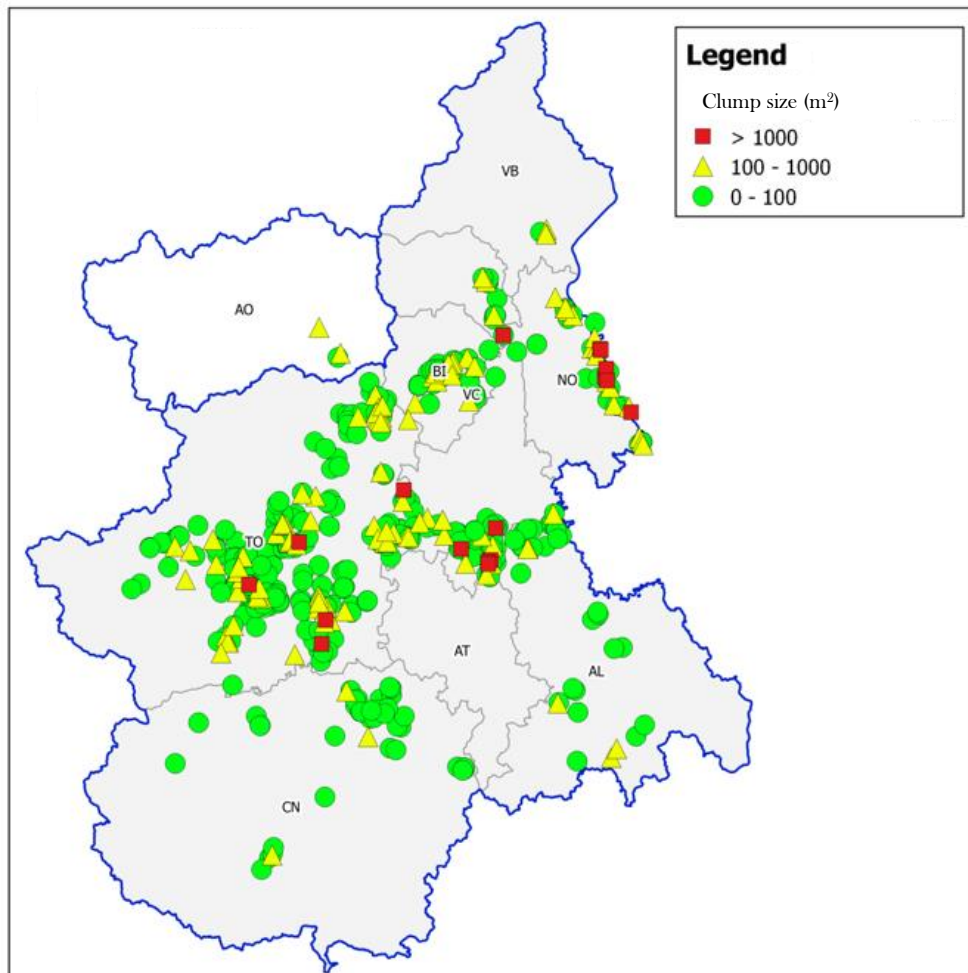
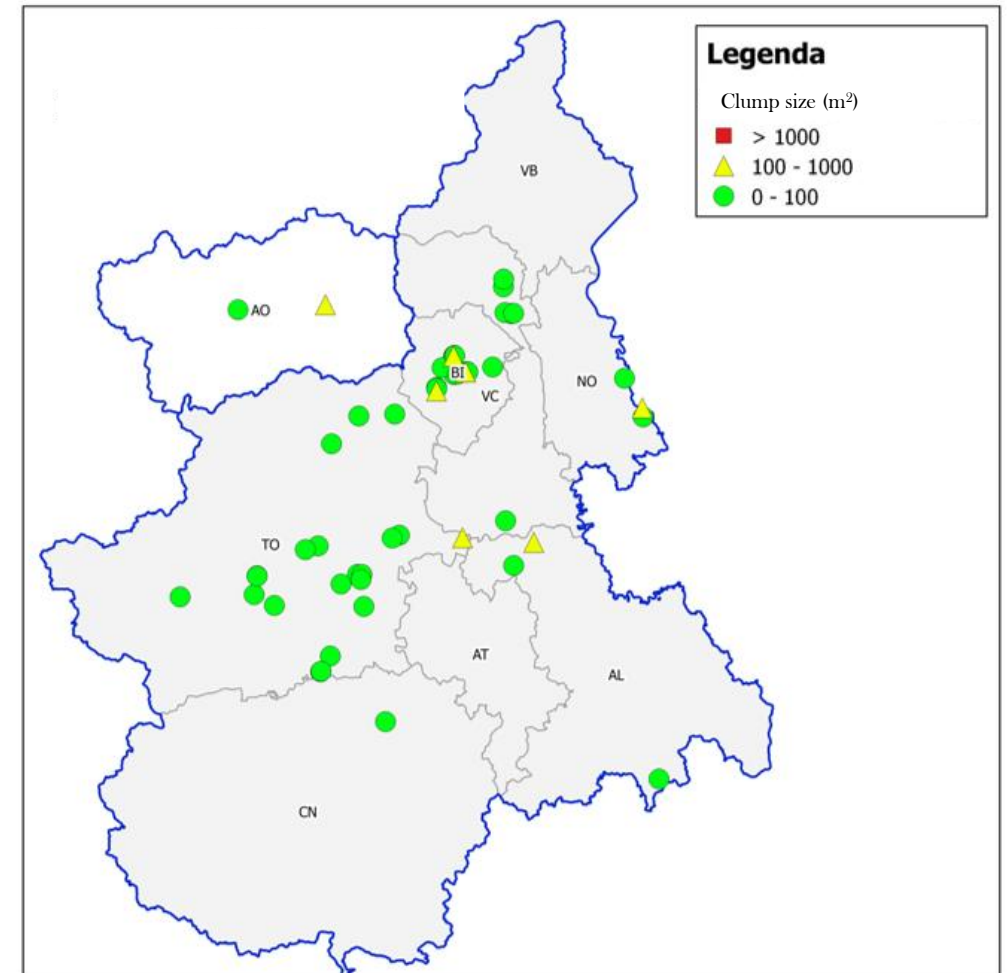
GUIDA ALL'IDENTIFICAZIONE DEI BAMBOO NATURALIZZATI IN PIEMONTE E VALLE D'AOSTA

www.bambapp.weebly.com

Ente di gestione delle Aree protette del Piu torinese | DISAFA | Progetto LIFE "Fortire è accogliere" | mosa | PROTEZIONE BAMBOO | REGIONE PIEMONTE



Distribution maps

Phyllostachys aurea*Pseudosasa japonica*

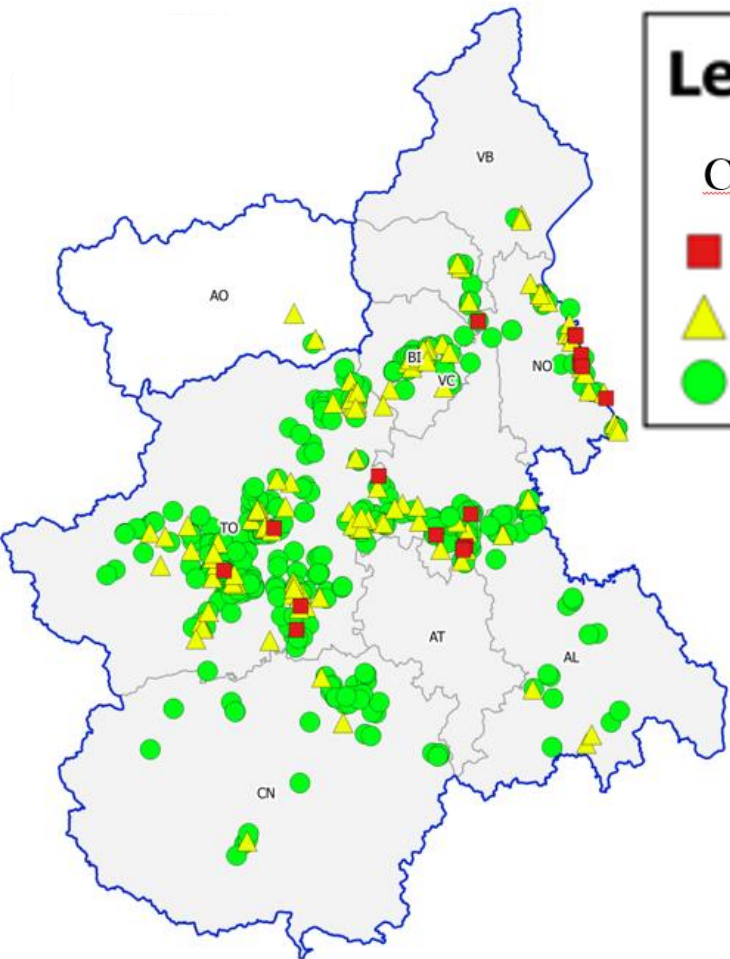
Distribution maps and clump size

Phyllostachys aurea

Legend

Clump size (m²)

- > 1000
- ▲ 100 - 1000
- 0 - 100

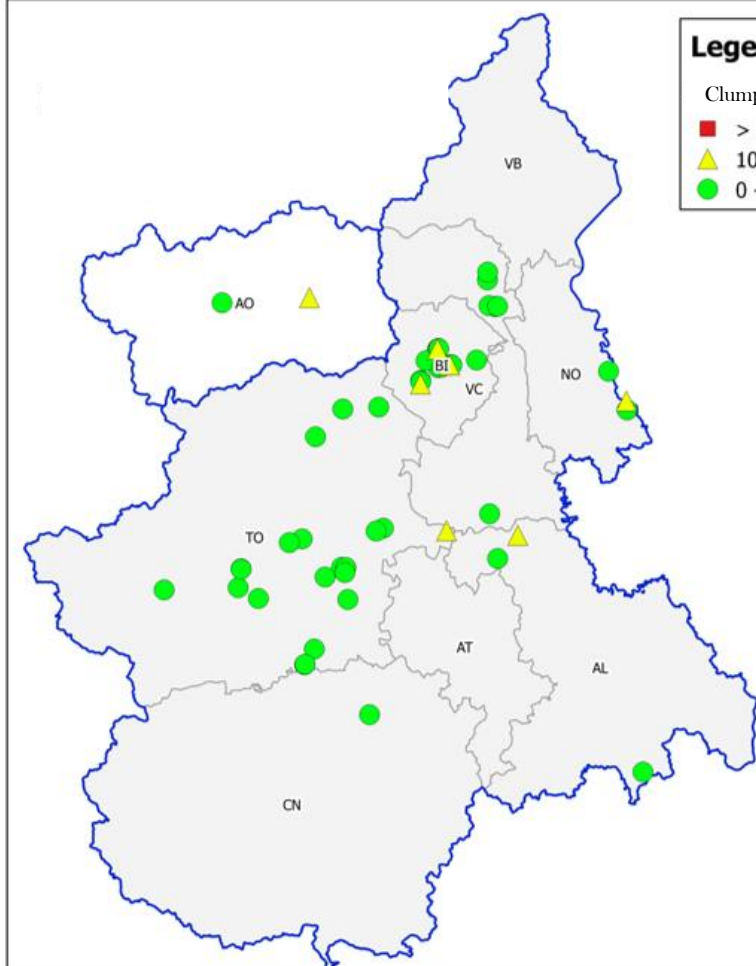


Pseudosasa japonica

Legenda

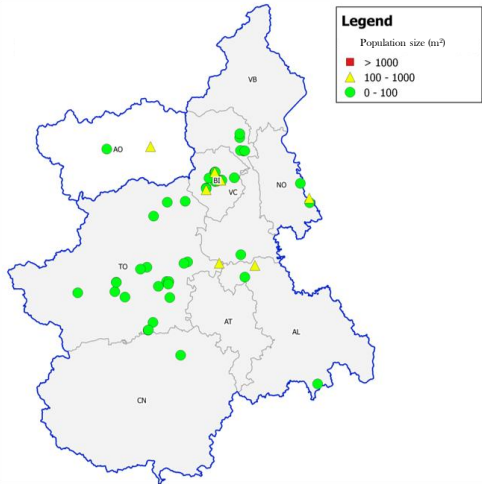
Clump size (m²)

- > 1000
- ▲ 100 - 1000
- 0 - 100

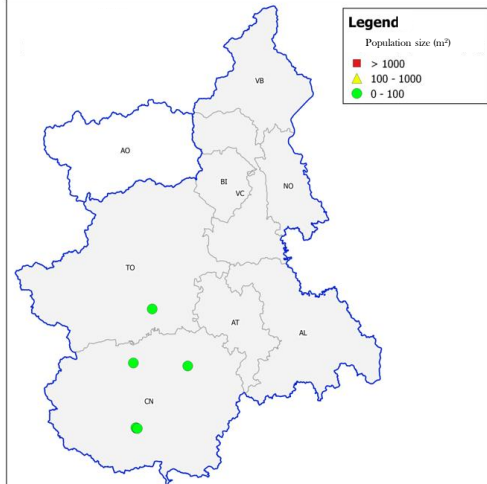


Distribution maps and clump size

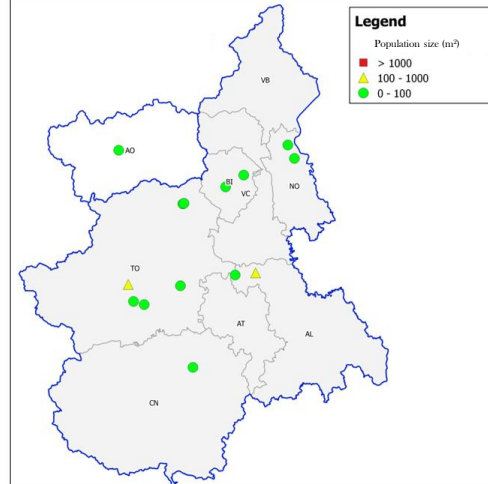
Pseudosasa japonica



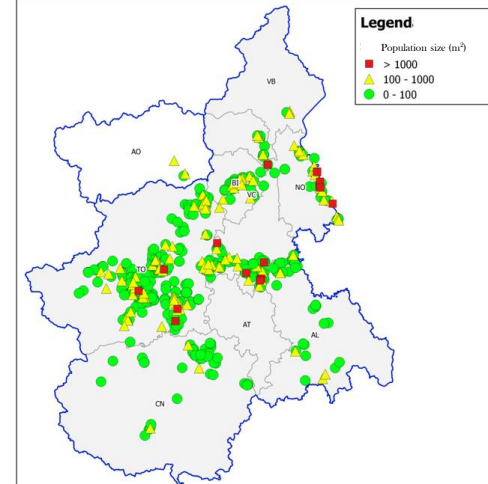
Semiarundinaria fastuosa



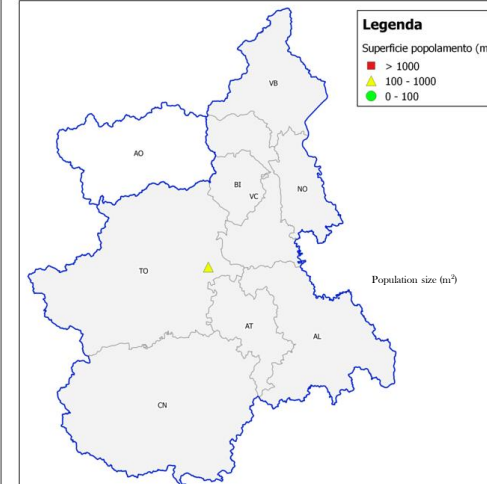
Phyllostachys nigra



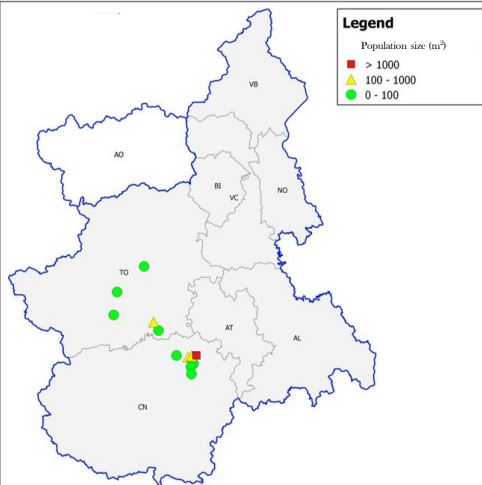
Phyllostachys aurea



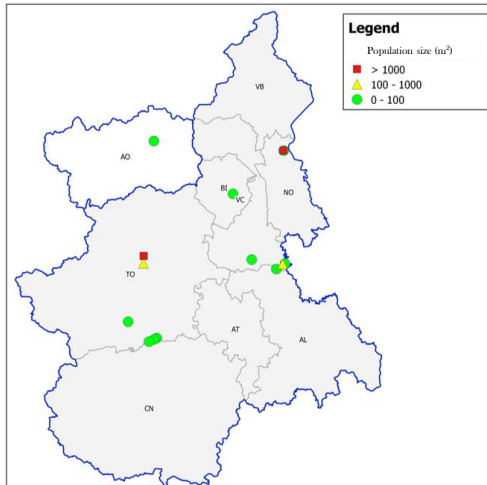
Phyllostachys edulis



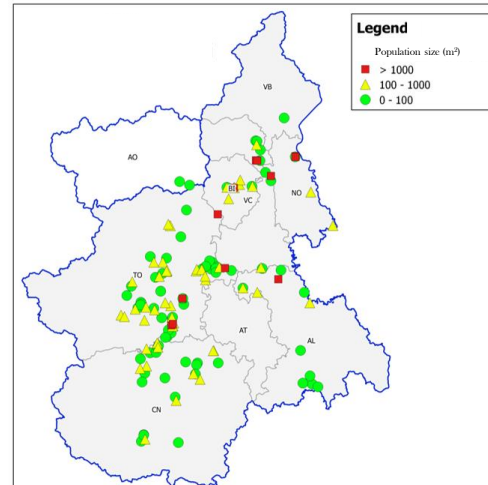
Phyllostachys flexuosa



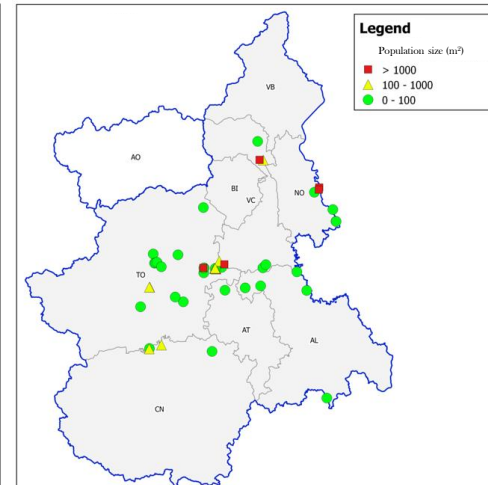
Phyllostachys viridis (= *P. sulphurea* var. *viridis*)



Phyllostachys viridiglaucescens



Phyllostachys reticulata (= *P. bambusoides*)

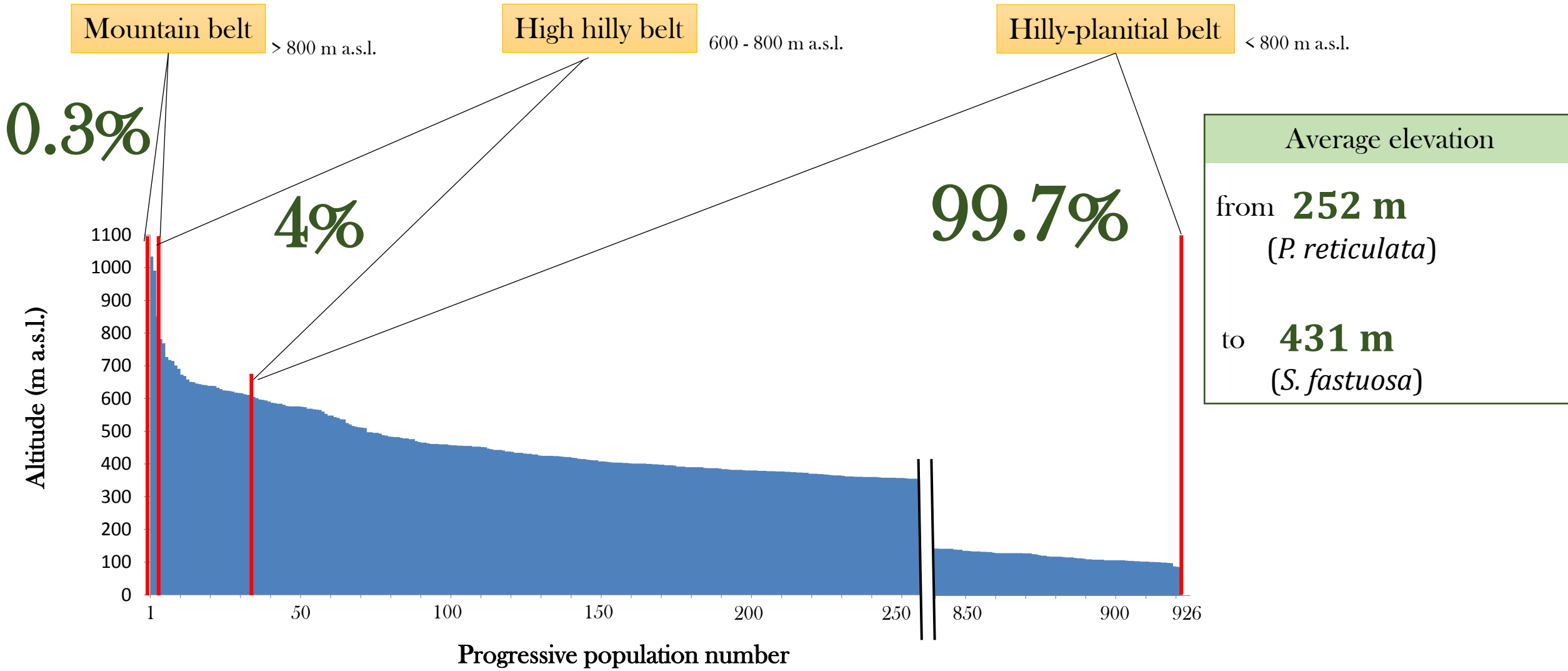


Legend

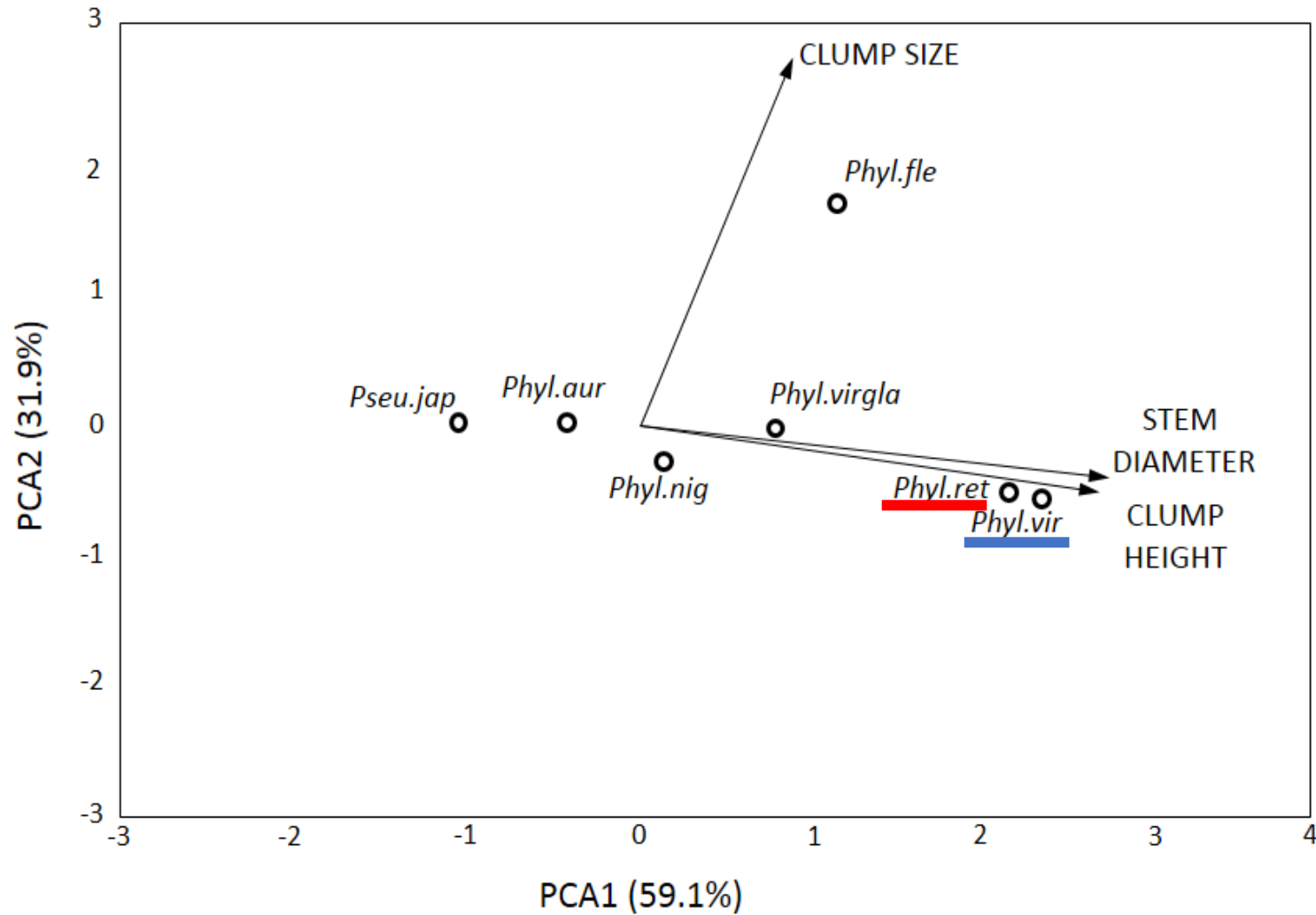
Clump size (m²)

- > 1000
- 100 - 1000
- 0 - 100

Elevation distribution



Invasive potential



Phyllostachys reticulata
Phyllostachys viridis

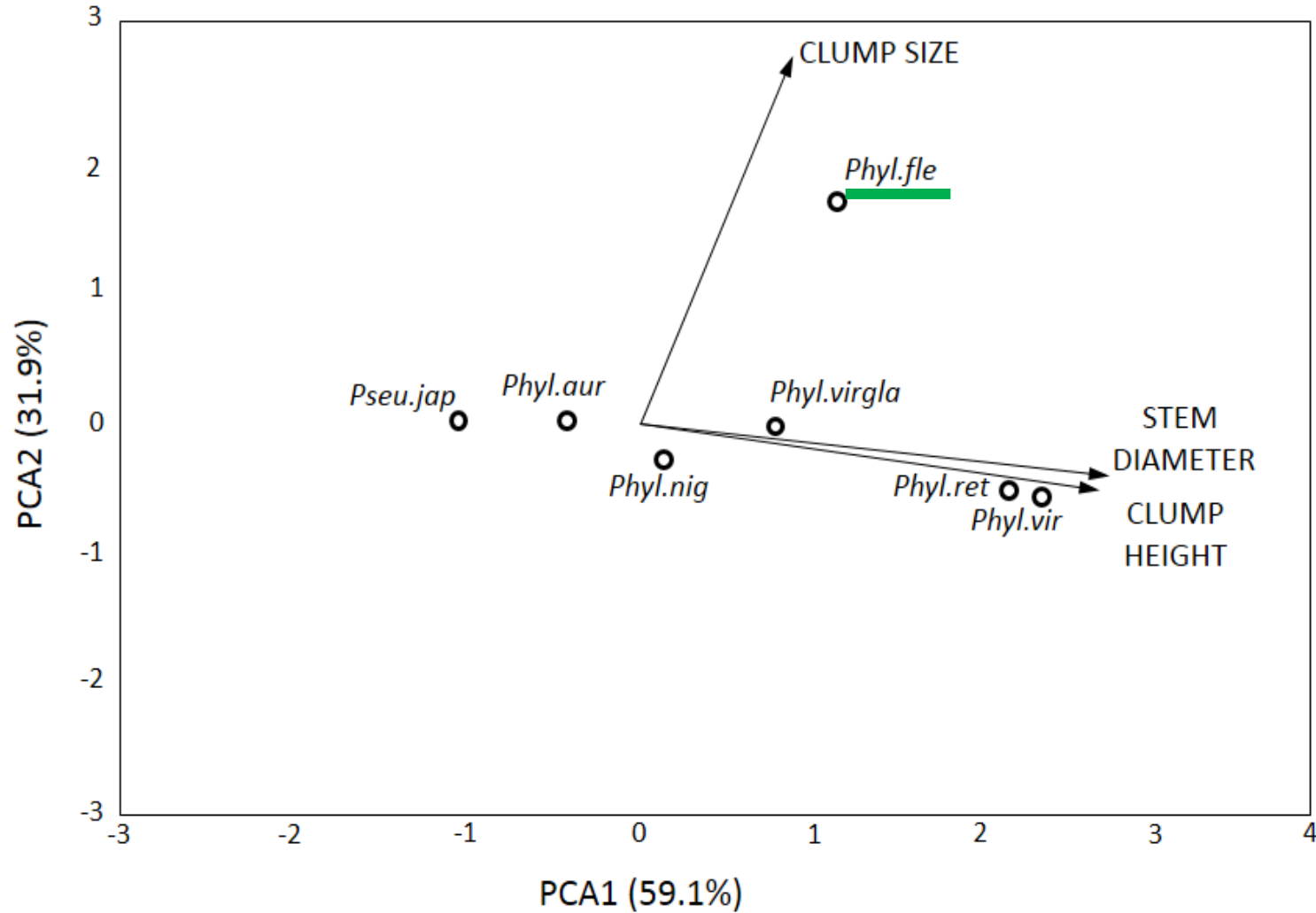


high values of stem height and diameter



likely invasive

Invasive potential



Phyllostachys flexuosa



- small diameter and short height
- high values of stem clump size

Invasive potential

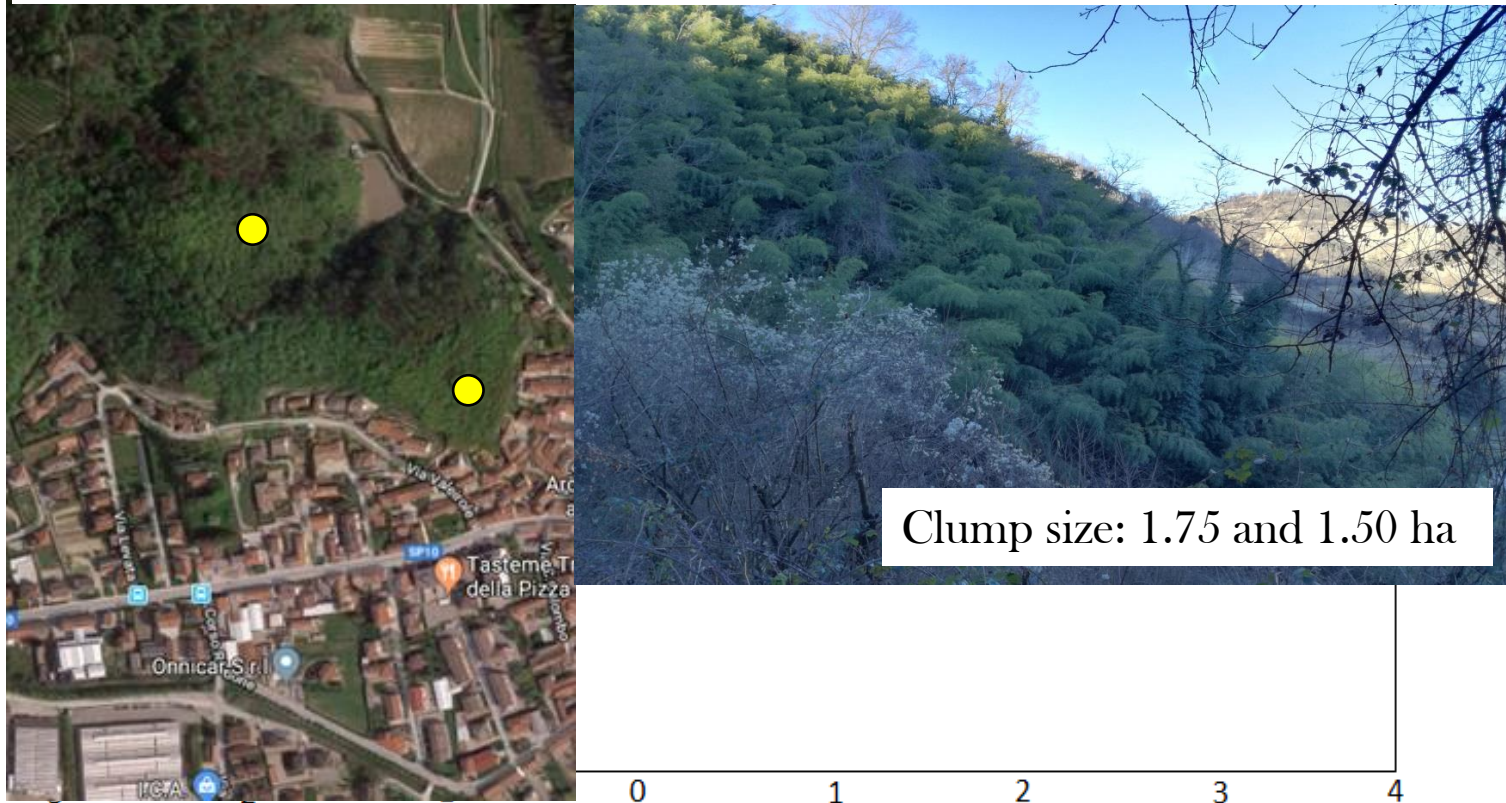
Introduced at the begin of XIX century and then expanded in the surrounding natural habitats (Corneliano d'Alba, south of Piedmont)

Phyllostachys flexuosa



- small diameter and short height
- high values of stem clump size

PCA2 (31.9%)



Invasive potential

Introduced at the begin of XIX century and then expanded in the surrounding natural habitats (Corneliano d'Alba, south of Piedmont)

Phyllostachys flexuosa

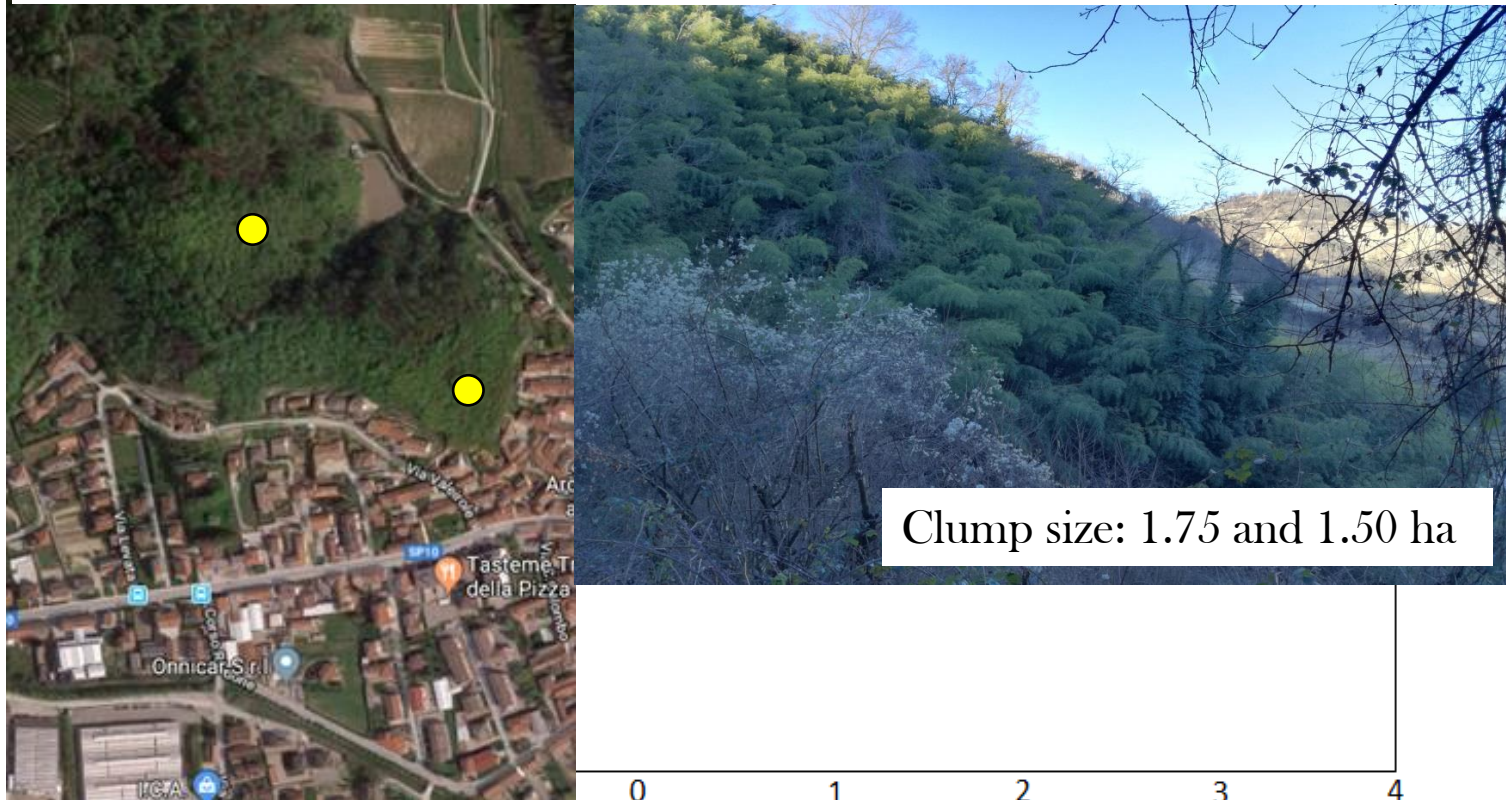


- small diameter and short height
- high values of stem clump size



despite its small diameter and short height, can be **potentially invasive if allowed to expand indiscriminately** for a long time.

PCA2 (31.9%)



PCA1 (59.1%)

Characterization of habitat distribution

ANTHROPOGENIC HABITATS

82%

- roads 56%
- other artifacts 27%
- vegetable gardens 13%
- private gardens 10%
- orchards 4%
- ditches and agricultural channels 15%

AGRICULTURAL HABITATS

60%

- uncultivated areas 25%
- meadows and pastures 24%
- plows 13%

NATURAL HABITATS

45%

- Both woods of high natural value and low-valued

Only 5% of clumps were exclusively in contact with 'NATURAL HABITATS'

Pseudosasa japonica

shade-tolerant species, often in contact with woods and wooded margins



About citizen science approach

- Ability to analyze **data as if collected** by representative **sample areas**
- **Good spatial distribution** of sample areas
- **Good sample number** ($n = 926$)
- **Representative results** that can be **generalized** throughout the **study area**

About results of the project

- Update of the information concerning the distribution of alien vascular flora of Italy and for Piemonte and Valle D'Aosta regions
 - S. fastuosa* → new record of naturalized flora of Italy (found in Piemonte)
 - P. viridis* → new species for the flora of both Piemonte and Valle D'Aosta regions
 - P. viridis* → status changed from casual to naturalized for the flora of Italy
- Many species not yet included in the blacklists showed morphological traits or occurrence in natural habitats for which they can be considered potentially invasive species.
- Provision of reliable and comprehensive information to public authorities for:
 - evaluating the invasive potential of bamboo species
 - regulating Bamboo plantation



Thank you for the attention

