

*International Conference on Research for Sustainable Development in
Mountain Regions*

**Bio-monitoring of the flora in the
transboundary mountainous forest of
Tunisian Central-West : the Case of
Bouchebka's Mountains**

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Presentation Plan

- **Introduction**

- **Methodolgy**
 - **Study site**
 - **Phytoecological Approach**

- **Results and Discussion**

- **Conclusions**

Introduction



Given that natural resources are under increasing anthropogenic pressures that cause malfunctioning of ecosystems and loss of biodiversity (Roche, 1998), this research focused on a sensitive natural zone that suffers from multiple factors (natural and human) that affect its floristic biodiversity.

The research was carried out in the region of Bouchebka, a transboundary mountainous area in the Central West of Tunisia.

The case study was carried out during the years 2013, 2014 and 2015 during the spring and summer seasons.

Problematic

This requires addressing the physical and human factors to explain the evolution and transformation of natural environments.

- **Does the human environment represent a constraint or rather an advantage to plant colonization?**
- The study of vegetation landscapes in this transboundary area of Tunisia turns out to be necessary both in ecological terms as the well in the originality of the issues posed by this region.

Principal Objective

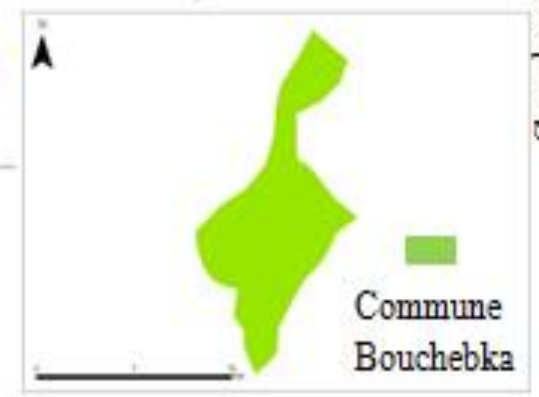
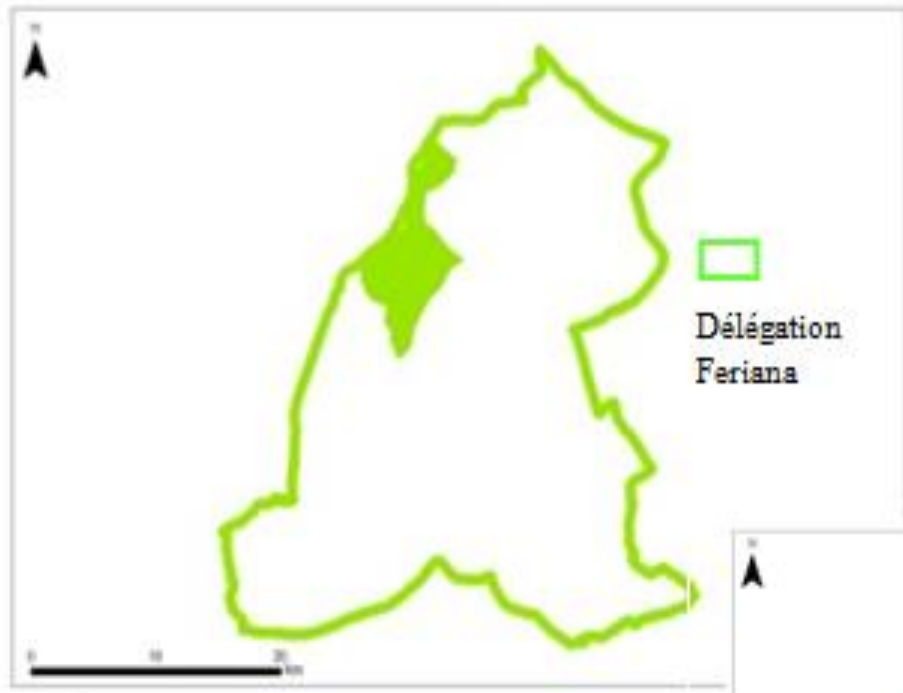
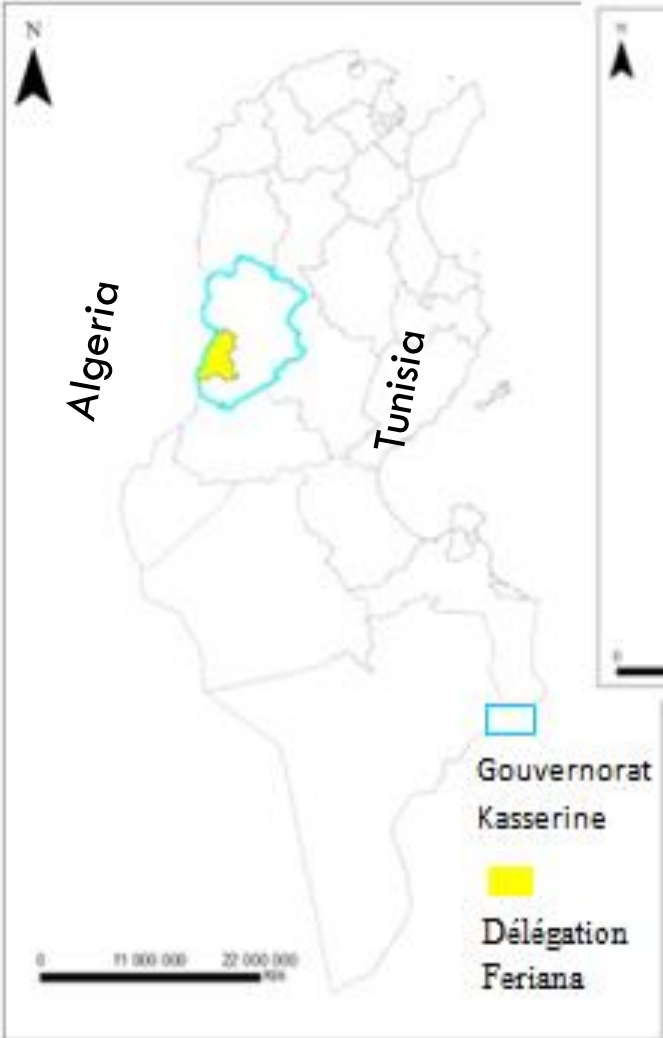


- **The purpose of this research was to identify the floristic spectrum of the forest in this area in order to follow the dynamics of this areas according to natural and anthropogenic transformations**

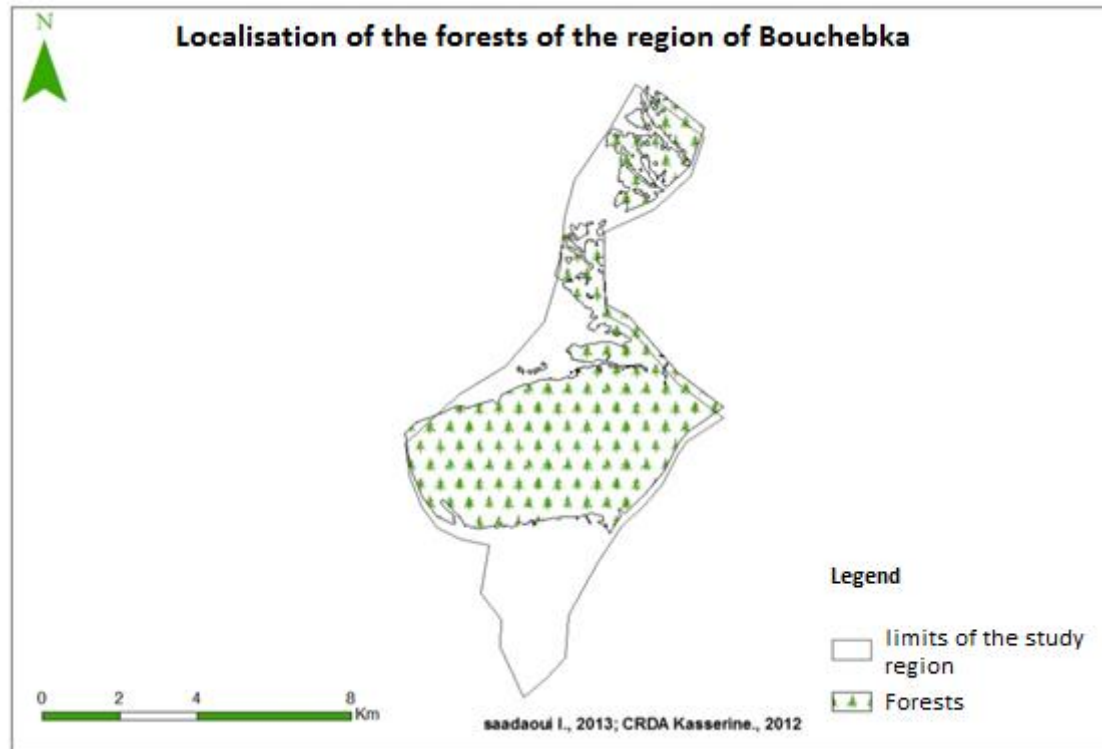
To achieve our goals, a Biomonitoring of the vegetation was conducted each spring and summer since 2013 over two plots with different human action during three years while highlighting the human and natural factors that affect their distribution.

Methodology

A landscape photograph of a hillside with sparse green trees and a clear blue sky. A tall antenna tower is visible on the left side of the hill.



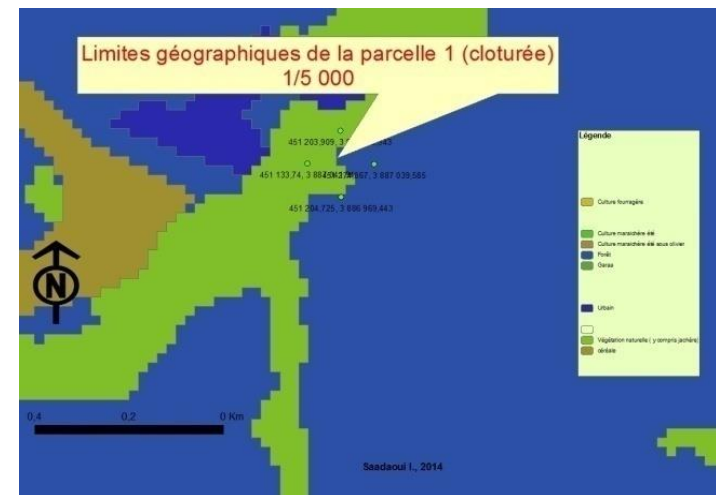
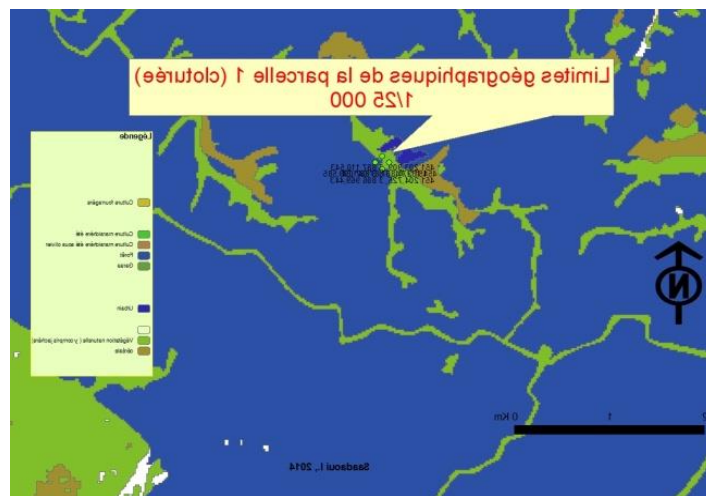
Study Site



- The forest environments series of Bouchebka is part of the great mass of Aleppo pines, located on the plateau between the Jebel Chambi and the mountains of Tebessa.
- Natural vegetation and forest represent 82% of the region's soil occupation

Study Site

- The inventory was conducted in the region of Bouchebka, specifically in the mountains of Dernaya.



Geographical position of the studied plot in the region of Dernaya

We note that the study area is close to an urban area, where the presence of human activities such as family farming and grazing, those activities allow us to study a forage crops, vegetables, olives and other crops.

Methodology

□ Protocol of the floristic inventory

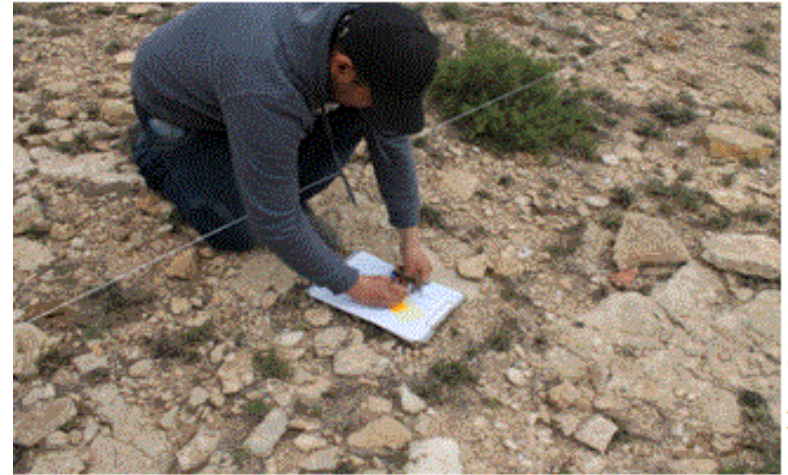
1. The first step is to record the geographic coordinates, direction and altitude of the observation area by means of a GPS



2. The second is about the delimitation the observation area



3. The third step consist on sampling the flora and taking an inventory



Saddaoui I, 2013

4. **Data processing**

From these data we followed the spatiotemporal evolution of the annual and perennial flora on the site



**Results
&**



Discussion

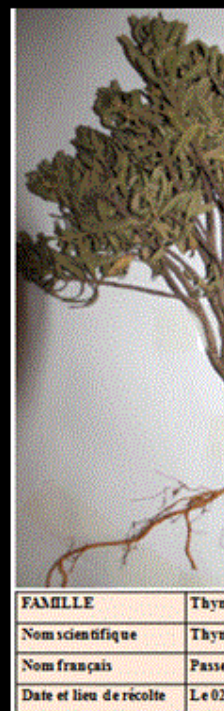
Estimation of the flora diversity

Our goal is to analyze the dynamics of plant communities.

• Species richness

Table : Number of families and gender of plants

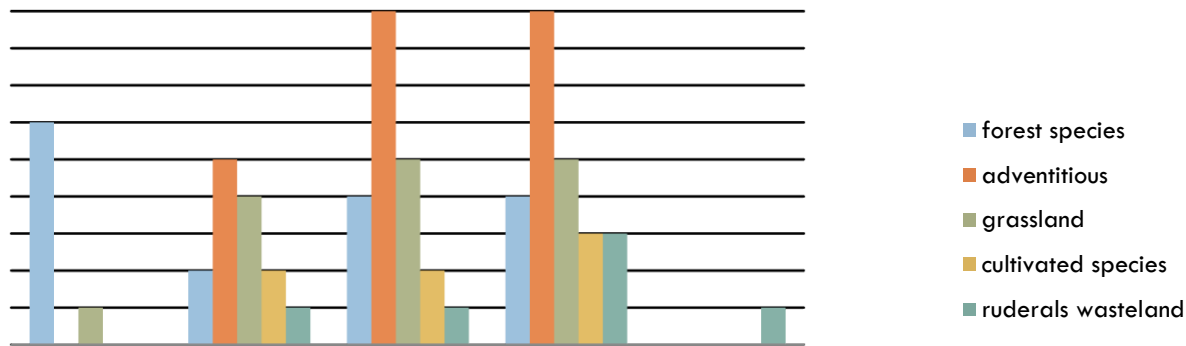
	Families	Gender
observation site (Bouchebka forest)	17	41



Floral spectrum of West-Central Tunisia mountains

Number of species

Ecological Group:



The distribution of forest species mostly depends on human action. Analysis of the results of dissemination modes shows that:

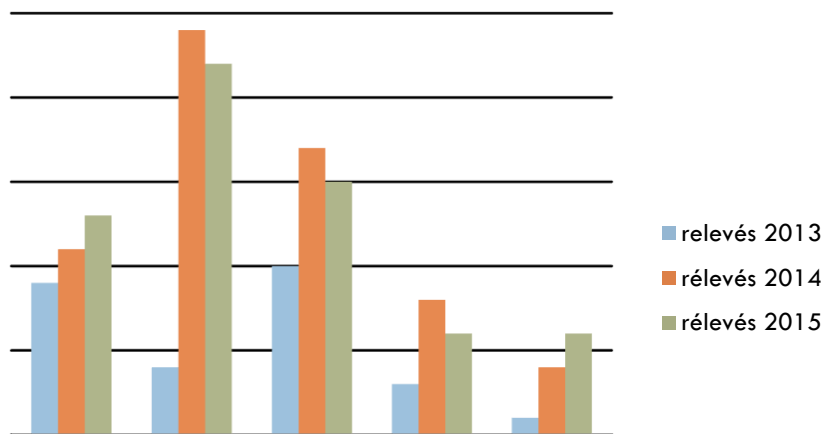
- The herbaceous species, annuals and biennials are disseminated mainly by anemochory, barochory and epizochory mode.
- Perennial forest species are mainly disseminated by endozoochory, and a high proportion of species encountered are planted by man (anthropochory).

spatiotemporal dynamics of the flora of the study site

main species in the territory analyzed

	perennials	annuals
Covered territory	Pa, Jo, Jph, Jt, Pha, Ga, Av, Aa, So, Ss, EuC, Acm	Sc, Ac, Rr, Rp, Dh Ds, Ro etc.

Nombre des espèces

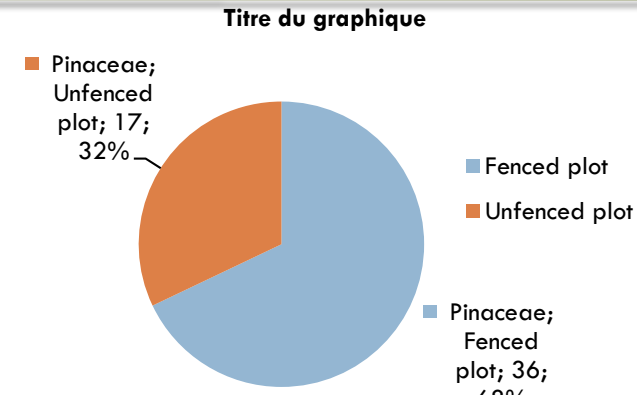
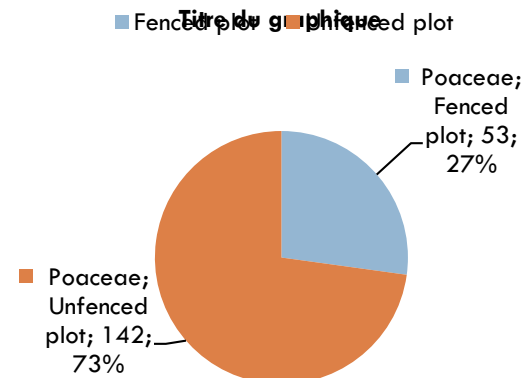
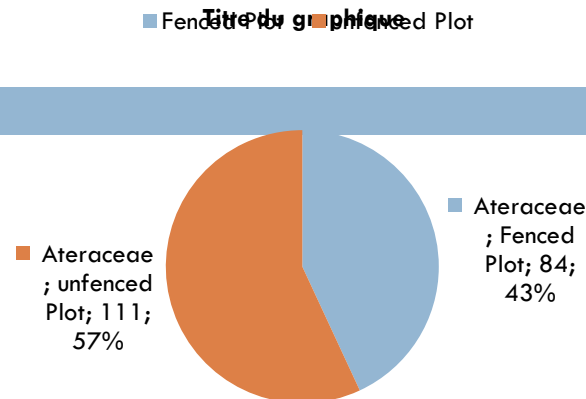
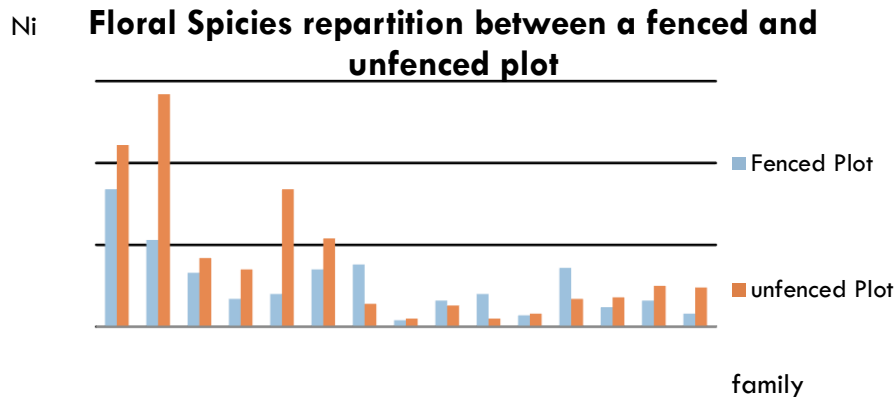


Ecological Groups

We noticed :

1. An evolution of the number of wildland species. Those species were completely absent during 2013.
2. Weeds also recorded a significant increase in number of species and numbers of individuals distributed by species
3. forest species are gradually increasing

□ Distribution of floral species in two different plots (Closed and not fenced)



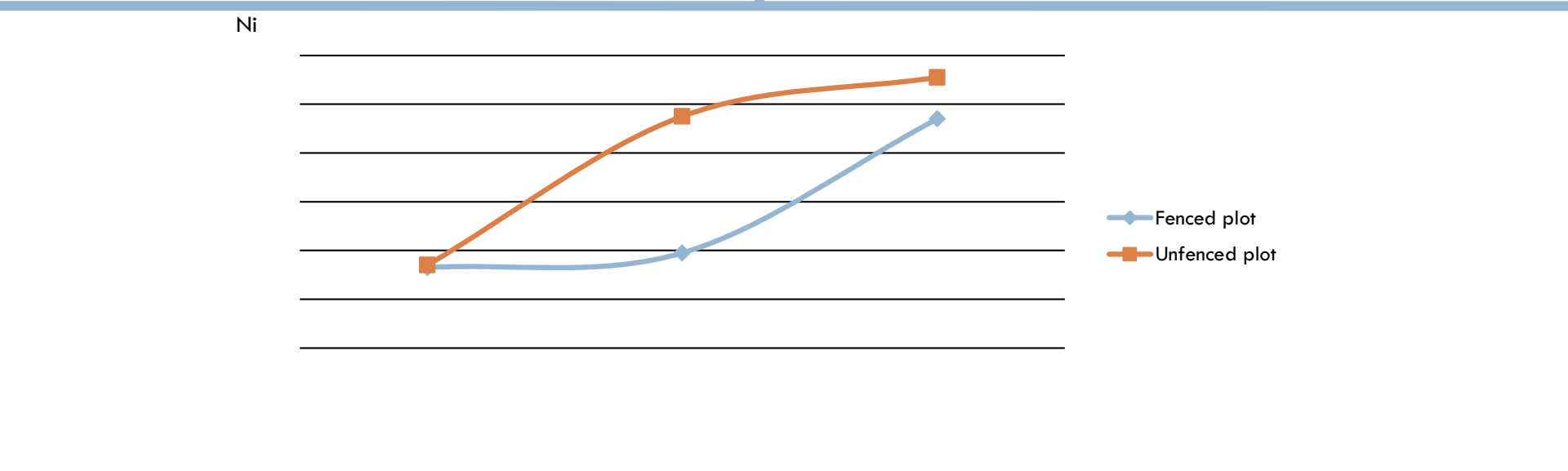
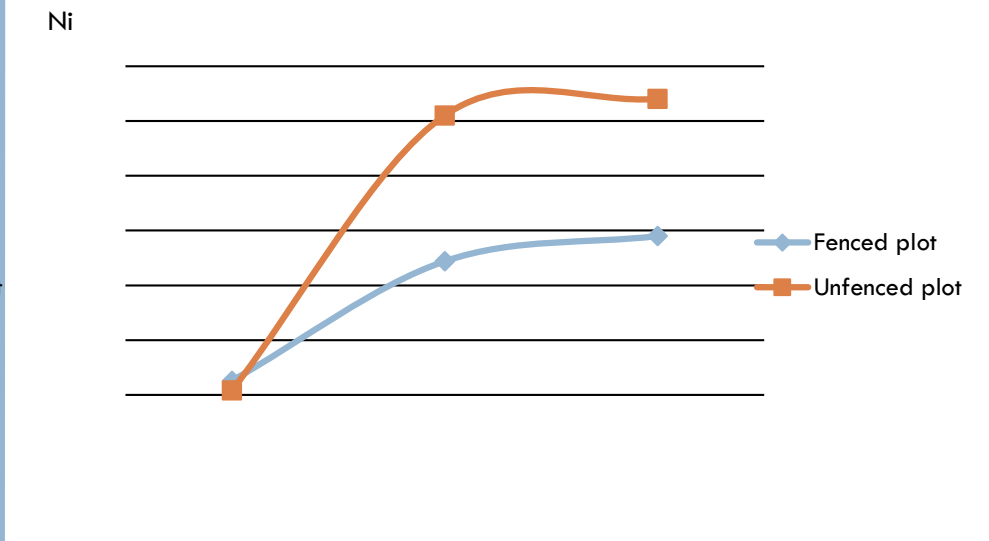
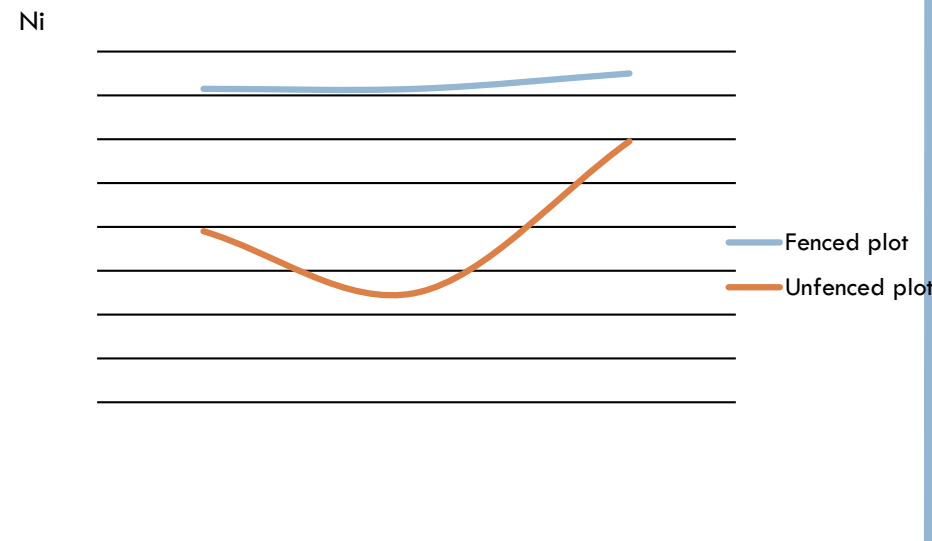
Species diversity is demonstrated by the counting number of families and gender founded in the site.

The diversity of families presented by 17 different families.

The overall flora is dominated by the Asteraceae.

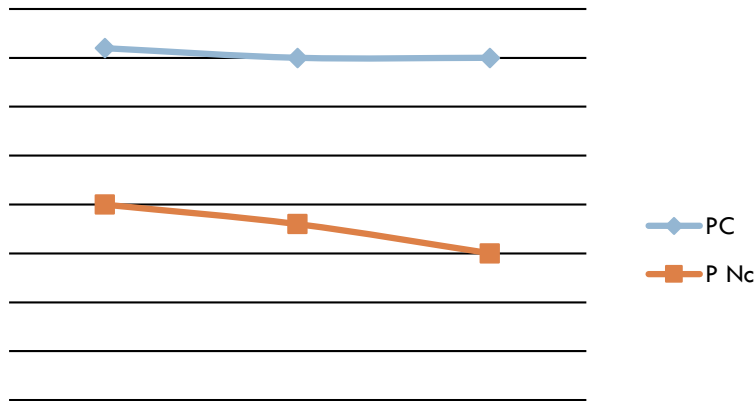
We noticed that the floral distribution is more important in the fenced plot

These species are mainly distributed on the unfenced land where human action is stronger.



➤ Abundance of forest species of Aleppo pine

Aleppo pine effectif



Evolution in the time



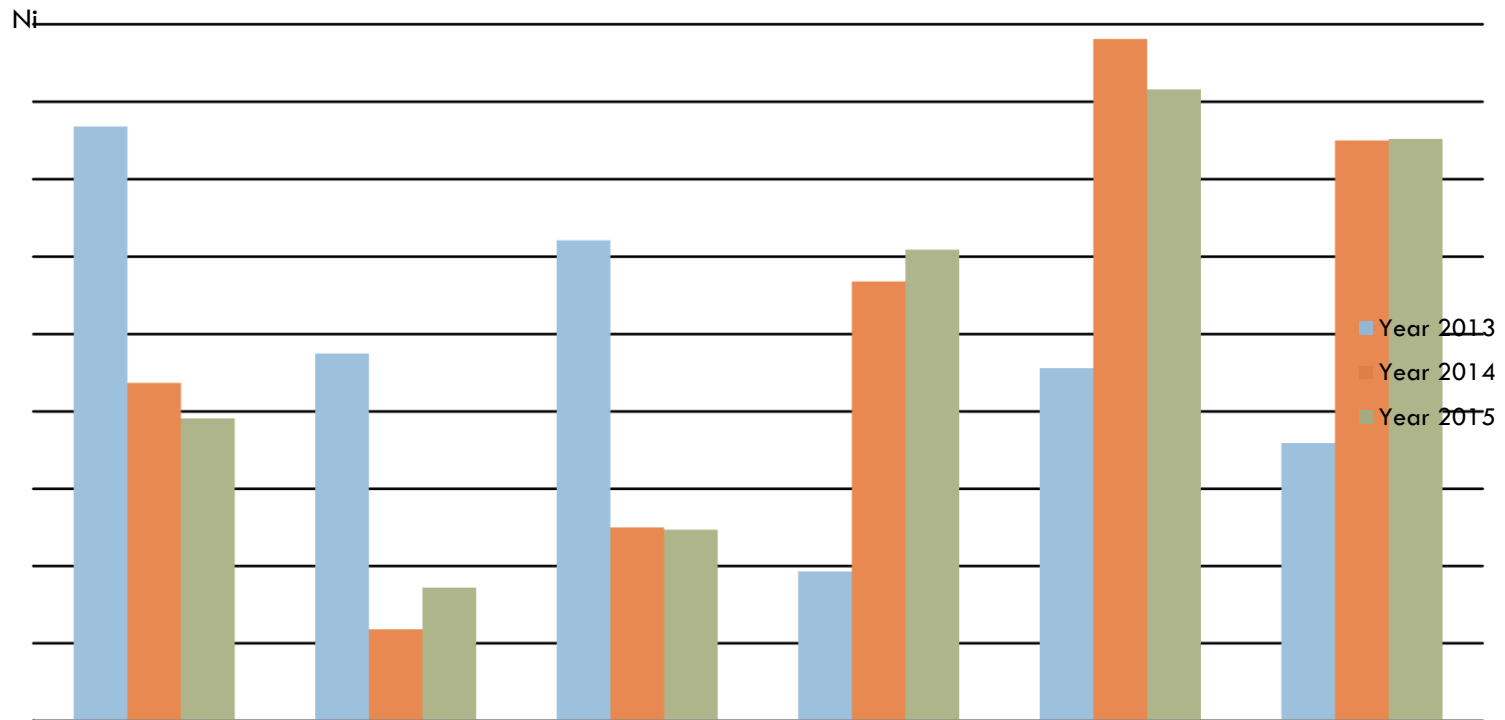
Reforestation action of Aleppo pine feet

This is especially the Aleppo pine which shows a progressive decrease from one year to another, despite the phenomenon of regeneration of forest species

The number of perennial species is gradually decreasing from one year to another. A drop in centesimal specific frequency was observed in both covered plots :

In the fenced plot : from 76.8% for 2013 to 39.1% for 2015

In the unfenced plot : from 47.5% to 17.2%.



Temporal and spatial variability of plant species in two plots submitted to different human actions

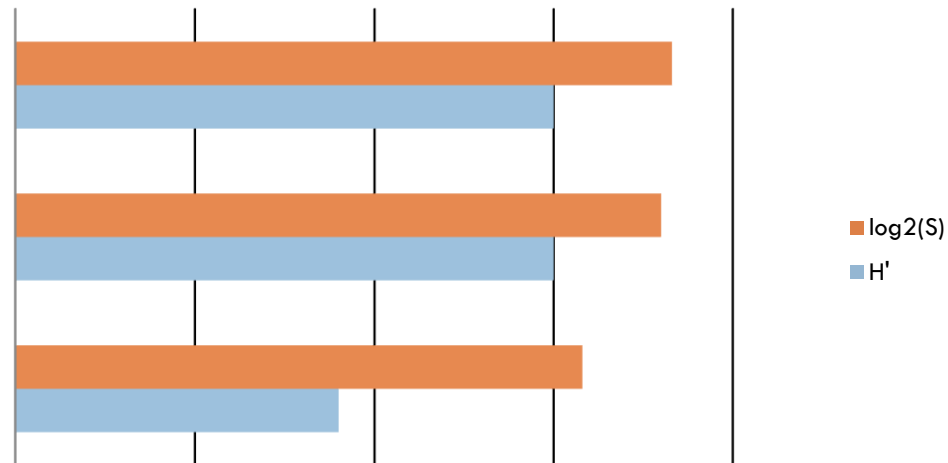
The index SHANNOON-WEAVER (H'):

the average value of H is equal to 5.5.

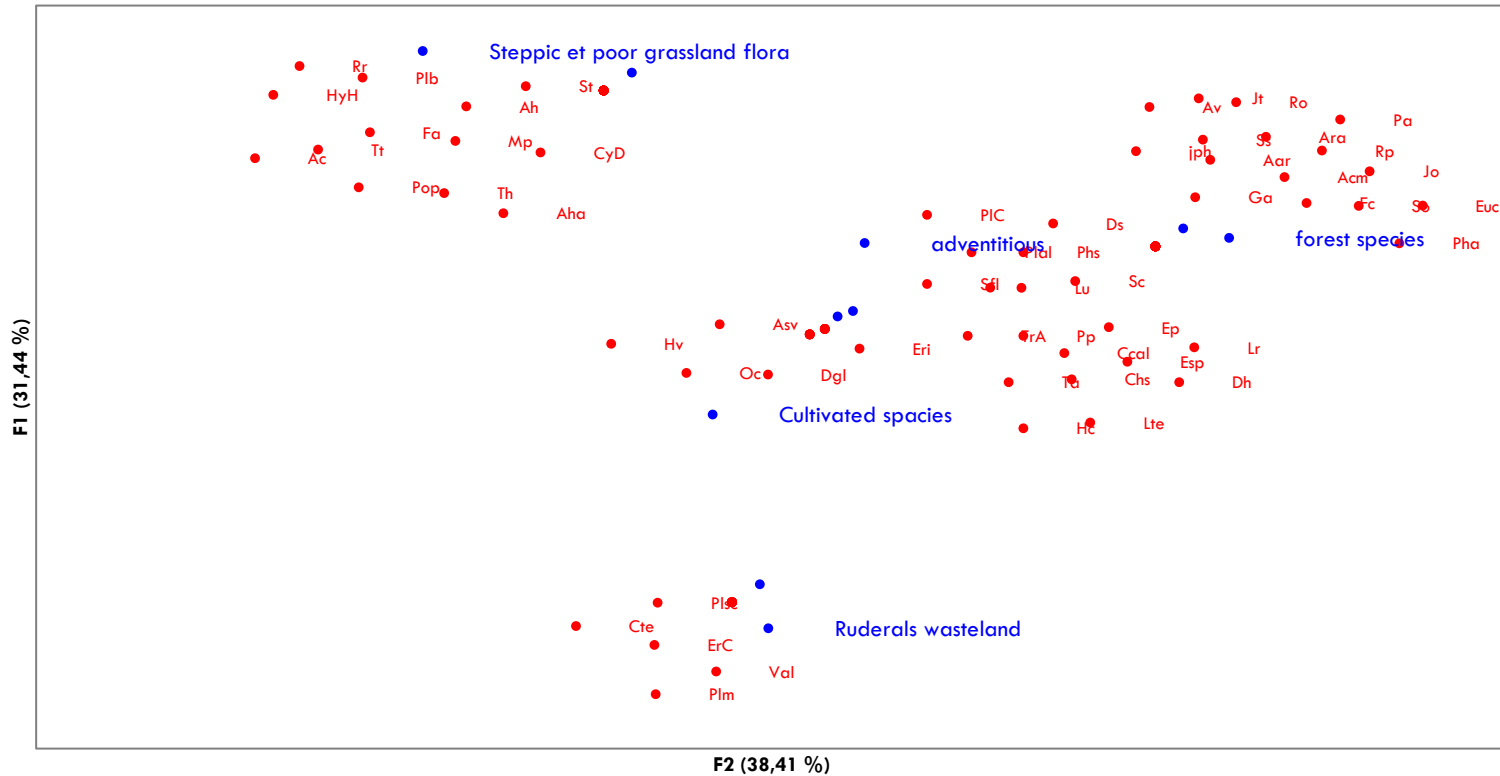
The value of H is between 0 and $\log_2 S$ was recorded as

$\log_2 S = 5.8$ in the territory studied, 5.7 in unfenced land and 5.4 in the fenced plot

Value of H'



columns of asymmetric graphic
(F1 and F2 axes: 69.85%)



**Interaction
of species
according
to their
ecological
groups in
the study
site**

Lignes: ecological Groups
Columns: species

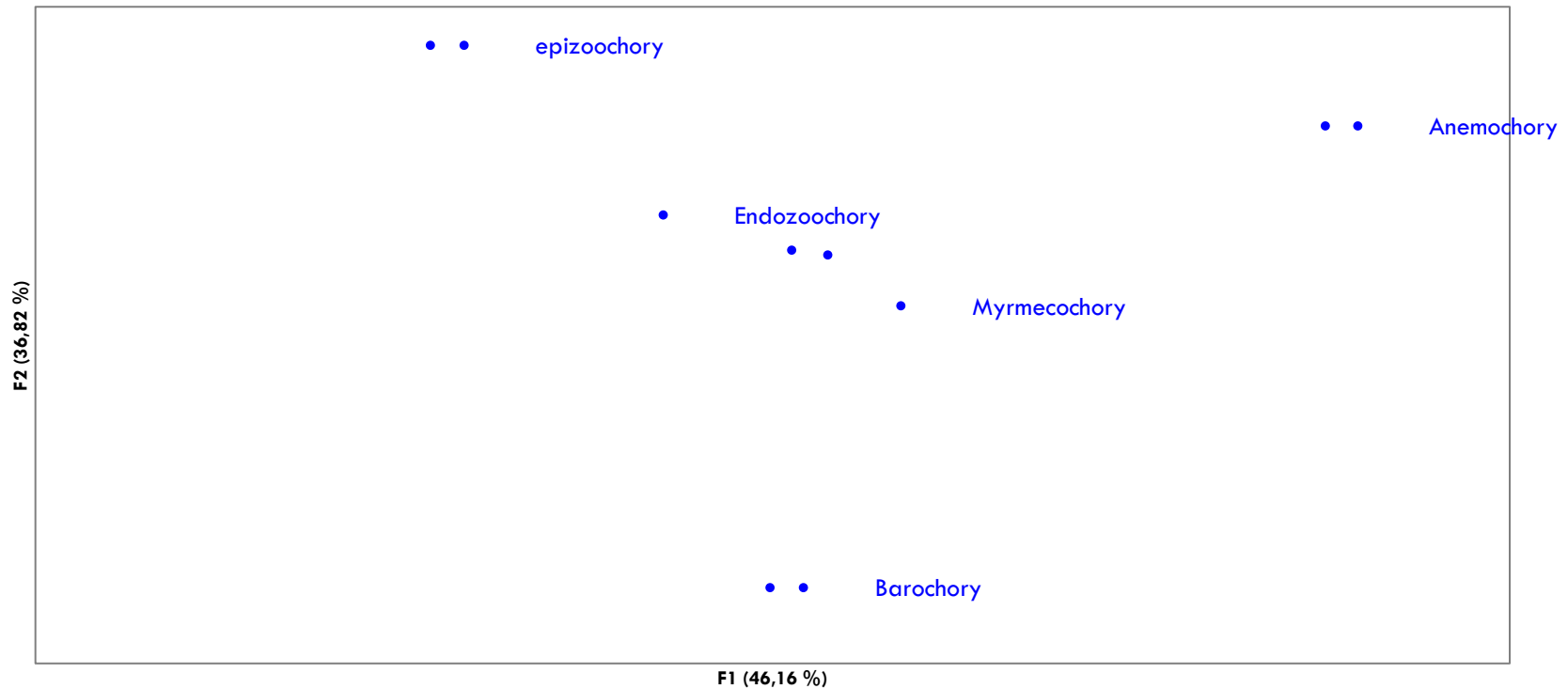


The species distribution in the positive side of the factorial axis F1. shows a positive interaction between the meadow and steppe species with forest species.

These results indicate the forest and pastoral vocation study site.

The factorial axis plan F1 shows that the dissemination modes of endozoochory, epizoochory and anemochory are the only modes that present positive indexes, proving the presence of human actions in the study site.

symmetric graph modes
dissemination (F1 and F2 axes: 82.99%)




• -
0,032987..

Factorial distribution of plant communities depending on the mode of dissemination in the study site

Conclusions

The area is characterized by its rich flora that is positively changing gradually under the influence of natural and human conditions that promote the distribution and the maintenance of certain species.

Indeed, the species distribution depends primarily on weather conditions, it was noted that the increase in annual rainfall from 2013 to 2015 has favored the emergence of new species especially annual herbaceous in the study site.

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- Also, we noticed especially that the number of Aleppo pine trees is following progressive decrease in shares of deforestation. Arguably human action affects the distribution of flora since it constitutes the major threat to sustainable forest plant communities and especially by the practice of grazing and excessive deforestation.
 - Policies of territories management have to be more rigid and more efficient especially in those fragile zones.

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