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Wildfires increase by climate change and have devastating effects on ecosystems, destroying forests, protected areas and cultivated lands. This destruction leads to a significant loss of biodiversity, affecting not only plant communities but also the arthropods that depend on them. Honey Bees, as generalist pollinators, are crucial for post-fire ecosystem recovery by facilitating plant regeneration and supporting habitat restoration for other species. This study aims to assess the impact of honeybee colonies' presence on insect biodiversity in fire-affected forests at the foothills of mountain Parnitha, Greece. The role of honeybee colonies in fire damaged ecosystems remains understudied. Specifically, it is unclear whether the presence of honeybee colonies affect the diversity and therefore insect populations in such areas. Understanding this relationship is essential for evaluating the ecological benefits of apiculture in post fire landscapes. To assess biodiversity in post-fire areas in relation to honeybee presence, thirty beehives were strategically placed in a burnt forest in mountain Parnitha. In the surrounding area, four seasonal samplings were undertaken, with entomological sweep-net from 10 random spots. Also, another fire affected area was selected for sampling, using the same protocol, which was far away more than 3 km for every known bee keeping area. Simpson Index of Biodiversity was calculated to assess the differences in insect communities.

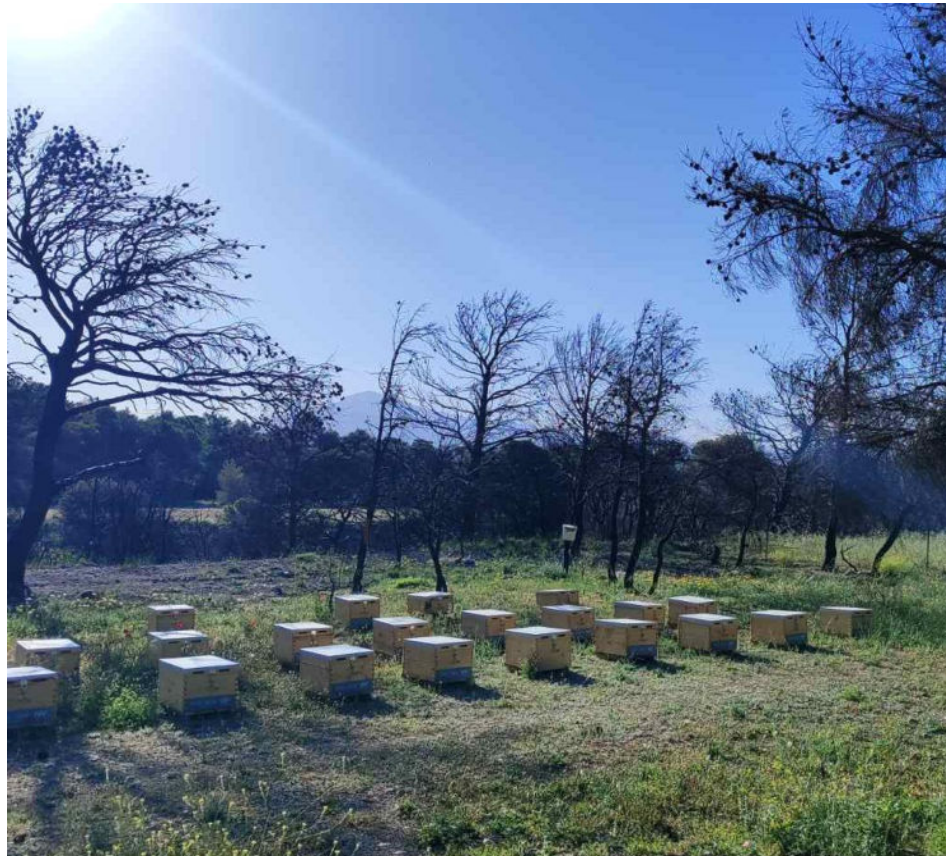
In the summer samplings, the area with honey bee colonies exhibited higher biodiversity, with a Simpson index of 0.960 compared to 0.726 in the area without honeybees. The samplings of autumn exhibited almost similar results. These findings suggest that honeybee presence may enhance insect biodiversity in fire affected areas, by supporting plant regeneration and creating more diverse habitats.

Beekeepers can play a vital role in post fire ecosystems recovery by strategically placing their beehives in fire affected areas. The presence of honeybee colonies not only supports plant regeneration but may also promote insect biodiversity, contributing to overall ecosystem restoration. This highlights the ecological value of beekeeping beyond honey or other bee products production, emphasizing its potential as a tool for environmental restoration. Further monitoring is needed to confirm these trends and assess long term impacts.

Evaluating the Impact of Honeybee Colonies on Insect Biodiversity and Ecosystem Restoration in Mount Parnitha Post-Fire Forests

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THE PARNITHA BEE YOND PROJECT



Forest Wildfires

An event

- Not at all rare
- Violent
- Rapid
- Destructive



Effects of wildfires



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Increase of the
pollutants on
the
atmosphere

Increase of the
temperature,
decrease of
the rainfall
rates

Loss of
biodiversity



Post-Fire Regeneration

- ▶ Post-fire regeneration depends on mechanisms such as resprouting and reproduction through resistant seeds.
- ▶ Some species rely exclusively on unburned refugia.
- ▶ Pollinators play a critical role in maintaining biodiversity.



Pollination and Ecosystem Restoration

Insect pollinators: essential for the
pollination of many plant species

- I. After the fire: necessary
restoration of plant
communities
- II. Soil stabilization
- III. Habitat restoration



Pollination and Ecosystem Restoration



Honeybee: The most successful pollinator

- I. Social insect
- II. Very abundant colonies
- III. High adaptability
- IV. Highly developed foraging behavior
- V. Floral constancy
- VI. Extended activity within each year
- VII. Ability to be transported immediately in large groups

Importance of Honeybees (HB)

*Honeybees: general
pollinators*

Assess the impact of honeybee colonies' presence on insect biodiversity in a fire-affected forest

*Habitat
restoration
arthropods fauna*

*...nation leads
ed production*

*Faster regeneration of
the forest*



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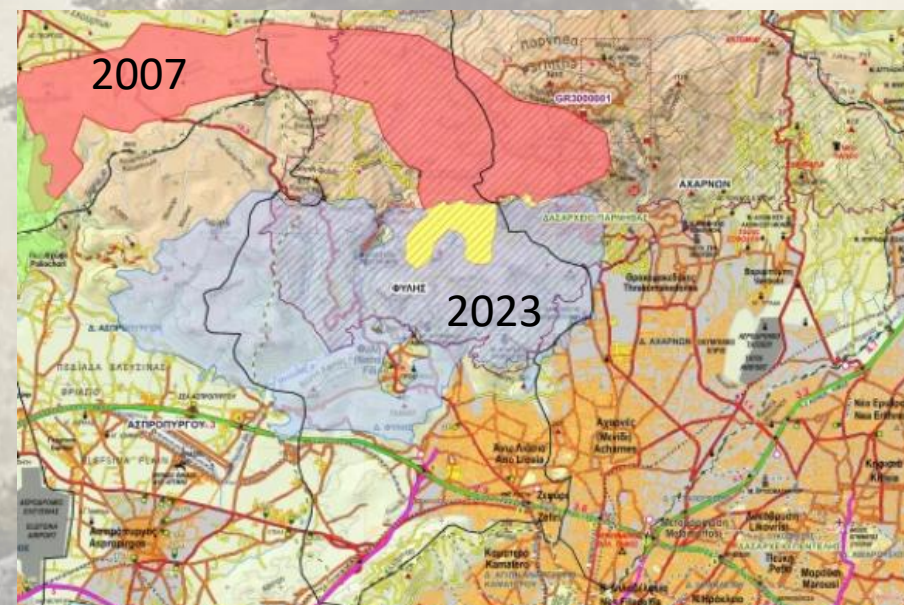
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- Parnitha is the largest mountain of Attiki located near Athens
- it covers an area of 30.000ha → Natura 2000=14.900ha

Recent Wildfires

- 2007: 4,900 ha of fir forest
- 2023: 5,900 ha of pine forest and shrubland



Materials and Methods

Materials and Methods

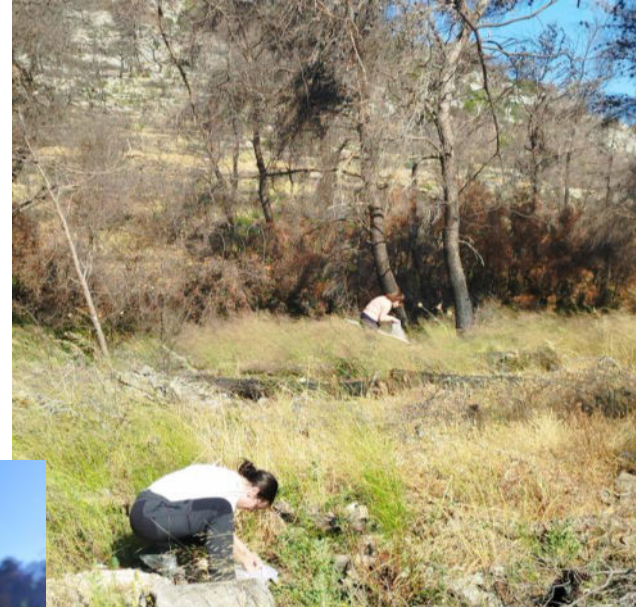


March 2024

- Beehives were placed in the burnt (during 2023) forest
- Seasonal samplings were undertaken from random spots around beehives (B)
- Seasonal samplings from random spots in an area 3km far from any known bee keeping area (W.B.) with similar vegetation

Seasonal Samplings

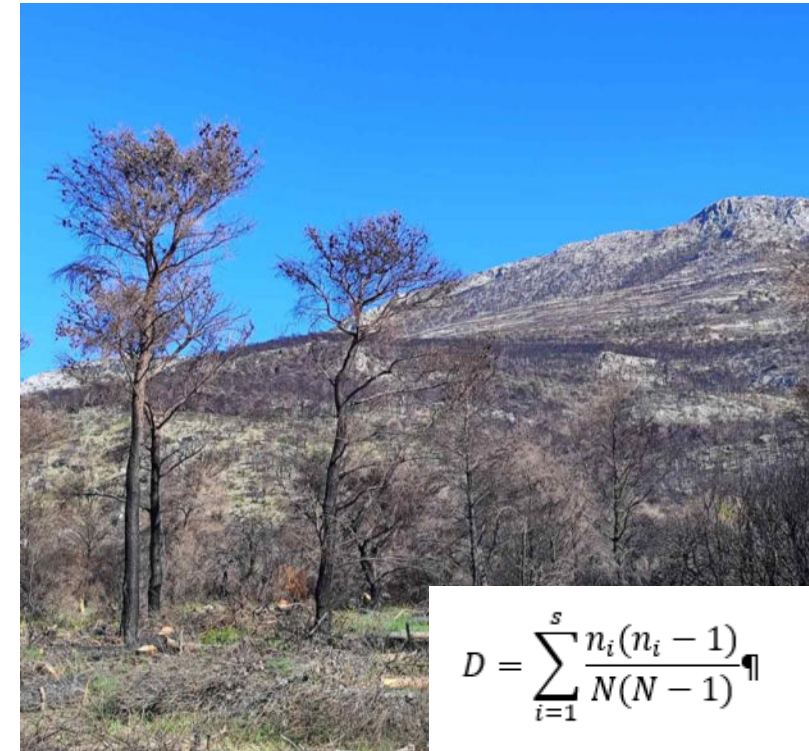
1. Entomological sweep net



4. Insect identification and Simpson index was calculated

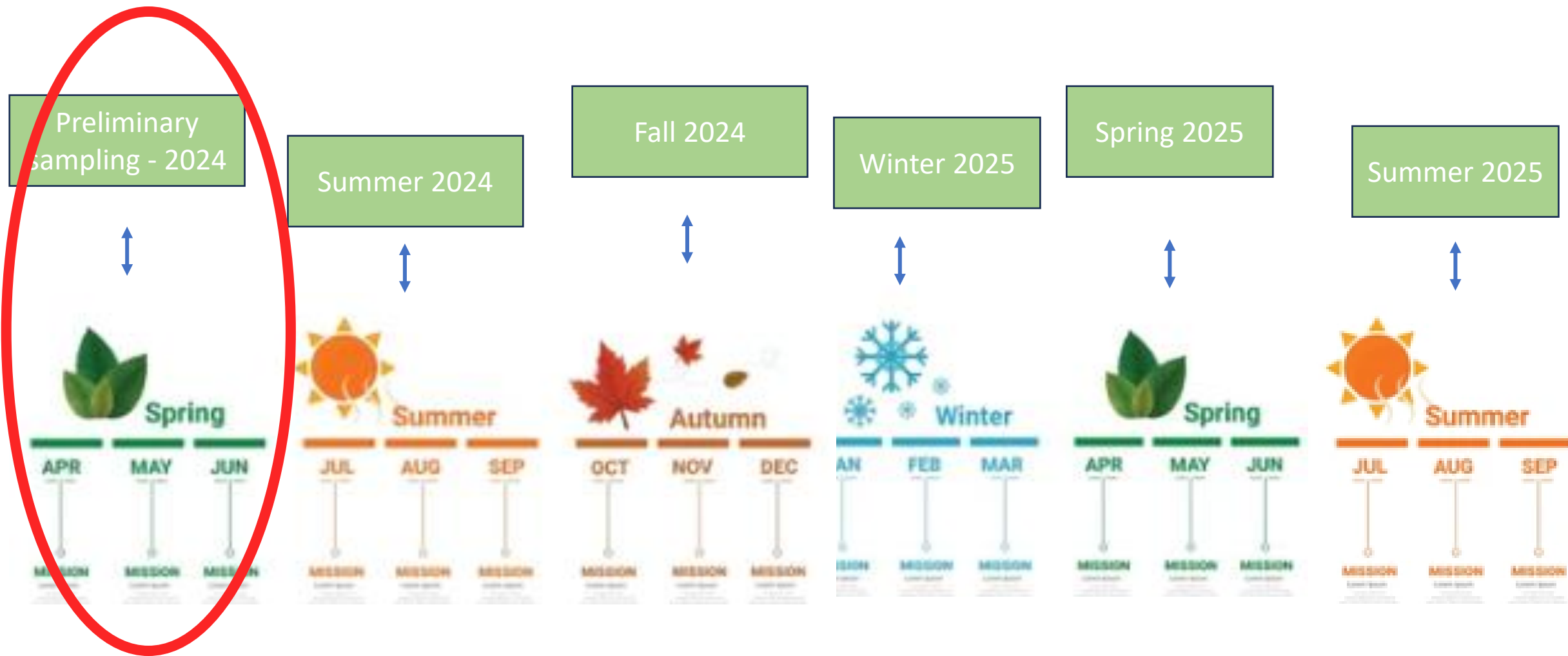


3. Ten spots per area (B and WB)



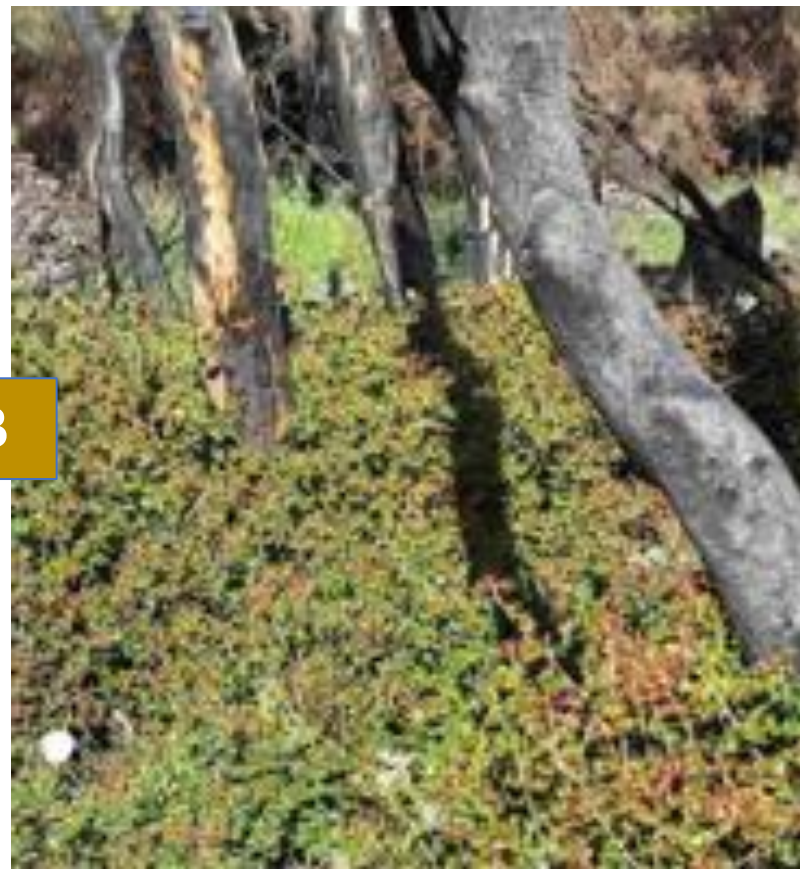
2. Collected insects: glass container

$$D = \sum_{i=1}^s \frac{n_i(n_i - 1)}{N(N - 1)}$$





B



WB

Preliminary Sampling

18.04.2024



Philaenus spumarius

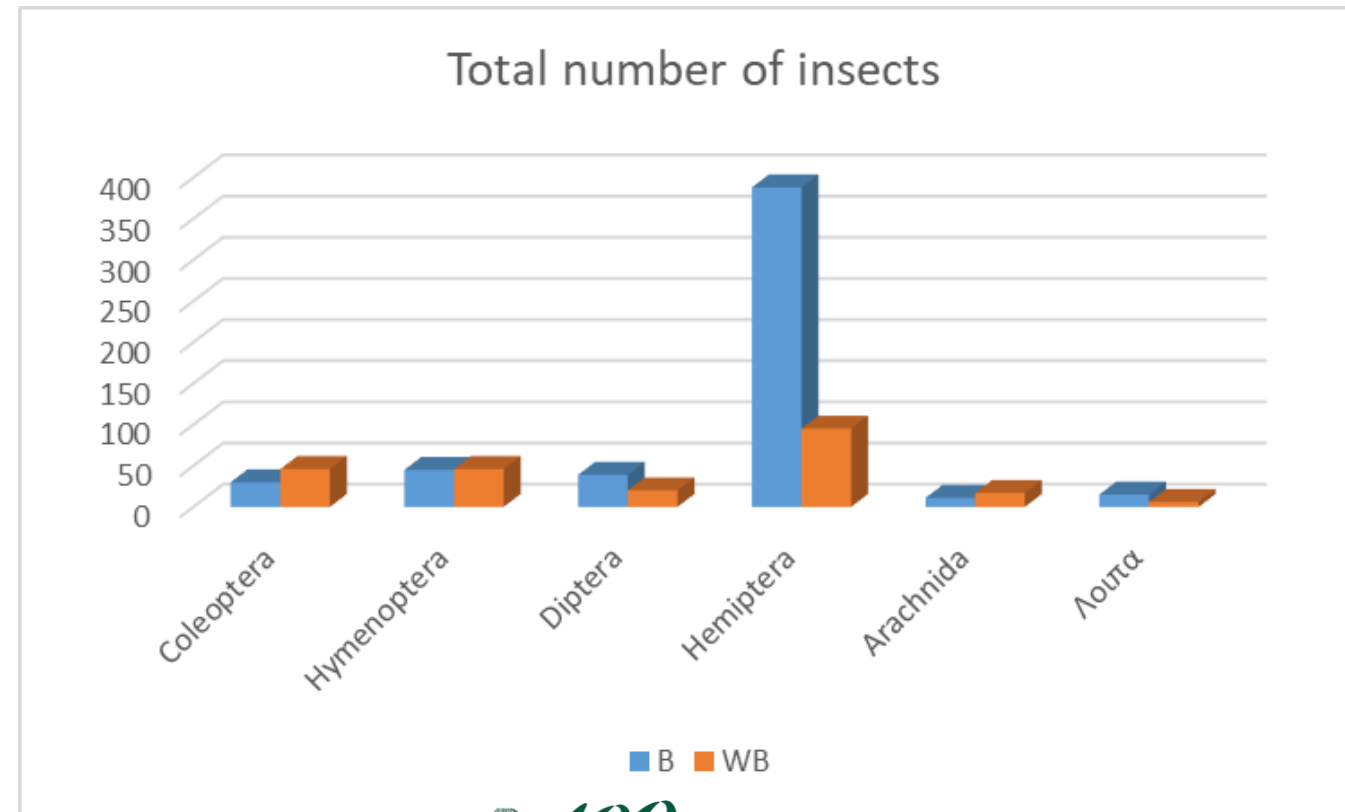


Aphididae



>60% of the population

	B	WB
Orders	8	8
# of species	63	57
# of specimens	501	208
1- Simpson	0.797	0.931



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Preliminary
sampling - 2024

Summer 2024

Fall 2024

Winter 2025

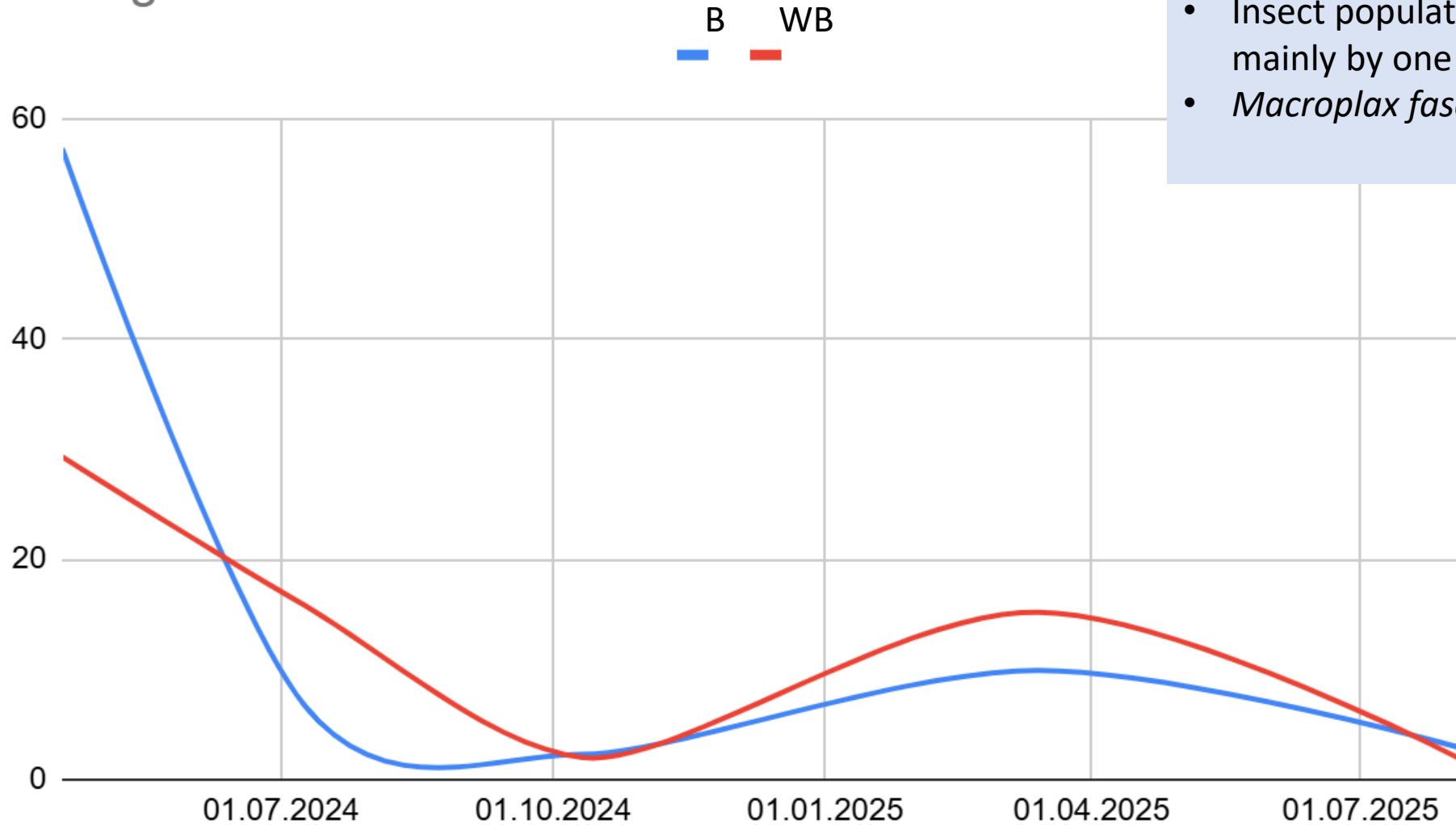
Spring 2025

Summer 2025



Still collecting...

Average number of insects



- More specimens collected in WB
- Insect population in WB consisting mainly by one species
- *Macroplax fasciata* in WB



Macroplax fasciata (Herrich-Schäffer, 1835)

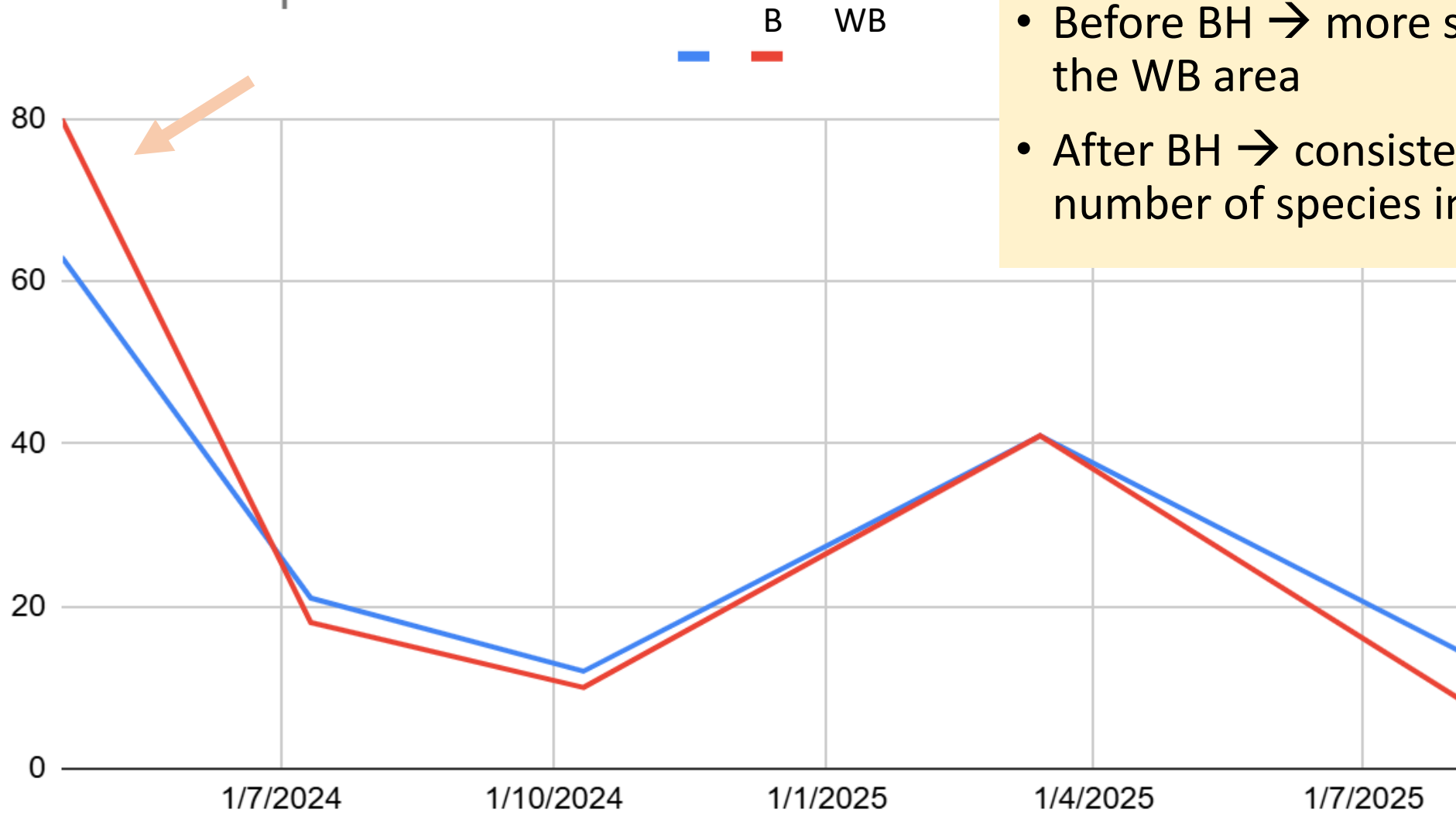


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Number of species



- Before BH → more species in the WB area
- After BH → consistently higher number of species in B area

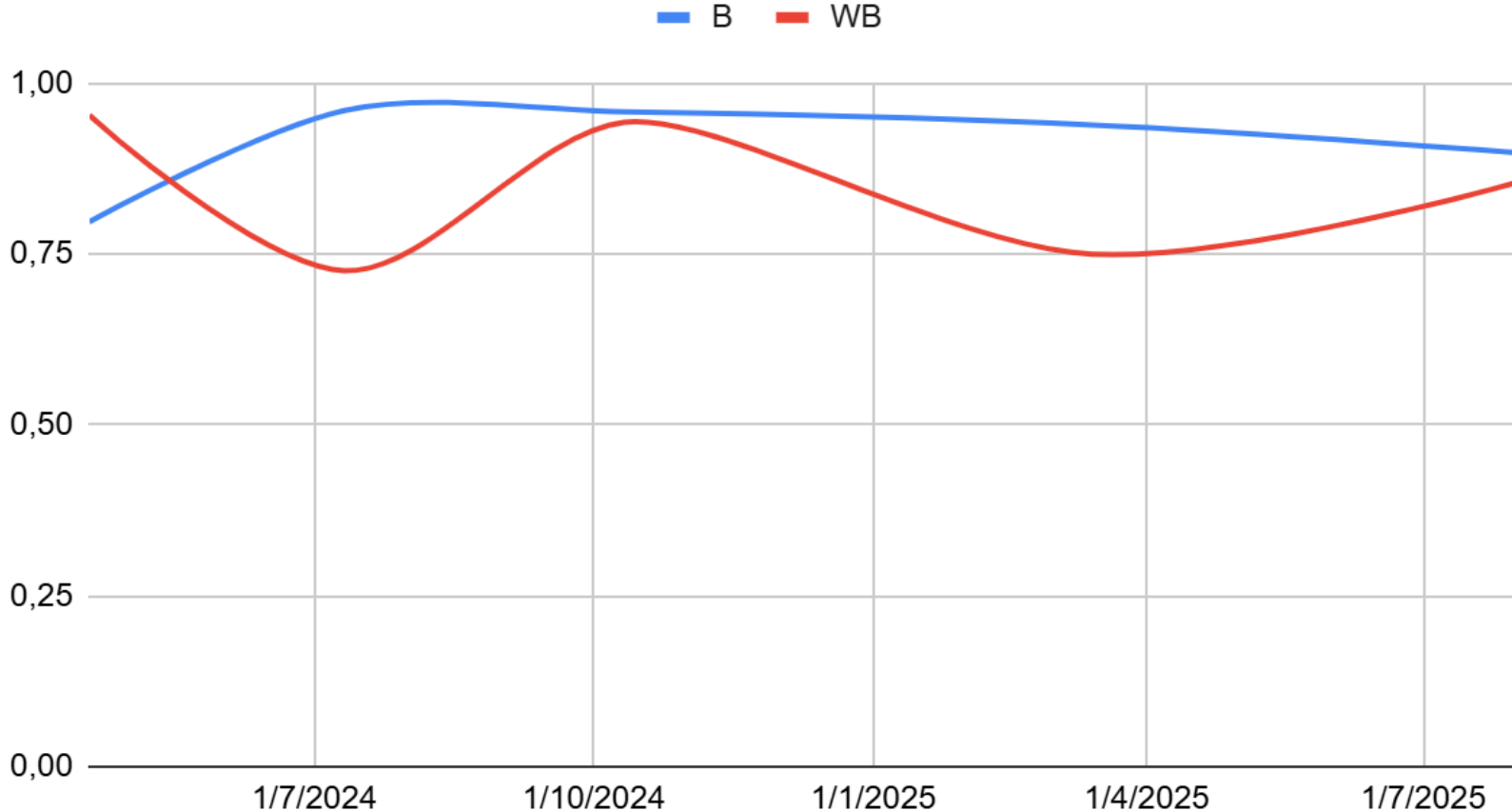


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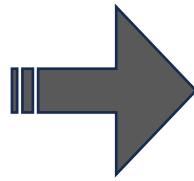
Simpson index



- After BH → Higher insect biodiversity in B area
- Before BH → Higher insect biodiversity in WB area

*Simpson index → closer to 1 = higher biodiversity

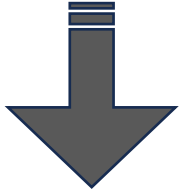
More insect abundance
in the area without
beehives (WB)



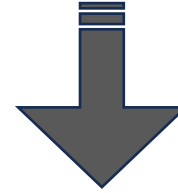
The population
constituted mainly by
one species: *M.*
fasciata



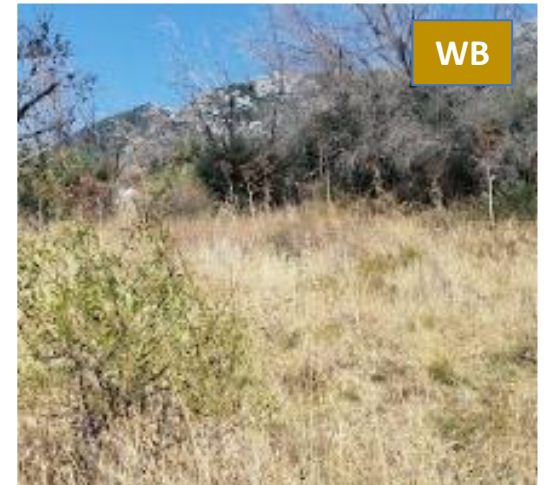
- Pest of agricultural crops e.g cereals
- Found on Poaceae weeds



- ✓ Higher species number
in the area with
beehives (B)
- ✓ Higher biodiversity in B



A population that
constituted mainly by
one species → low
biodiversity



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Preliminary Results

Presence of bees in fire affected areas:

- Enhance insect biodiversity
 - Promote plant regeneration
-
- ✓ Ecological value of beekeeping beyond honey or other bee products production
 - ✓ Potential as a tool for environmental restoration.

...Further investigation needs for more robust results



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General Objective of the presence of BeeHives

Wild Pollinators

Plant Communities

More Areas

Scientific documentation of the role of the honeybee in the post-fire regeneration of forests, providing yet another argument for ensuring beekeepers' access in them



Thank you for your attention