OP-190 [Beekeeping for Rural Development]
The accompanying fauna in honeybee colonies in tree-beehives and logs in Poland

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Background/PURPOSE: In managed apiaries, beekeepers protect hives from predators and maintain hygiene, minimizing pest intrusion. In contrast, tree beehives lack such protection, making the presence of other organisms in these nests inevitable. The study aimed to investigate the diversity of species cohabiting with honeybees in tree beehives and beehive logs, as well as their impact on the bee colonies.

Problem Description: The interactions between honeybees and other organisms in tree beehives are poorly understood, particularly regarding their role in forest ecosystems and potential competition with other pollinators.

METHODOLOGY: Between 2018 and 2024, samples were collected from approximately 50 honeybee nests in central and northern Poland. Material was gathered from the bottoms of tree beehives (nest debris and remains), as well as from the walls and covers of the exit holes. Insects and arachnids were identified to the order, family, or species level using identification keys for Polish arthropods. The organisms were categorized as “accompanying fauna” and grouped into parasites, predators, nest destroyers, cleptobionts, and accidental nest residents.

Results and CONCLUSION: The study identified parasites such as Varroa destructor and Phora incrassate, predators like wasps (Vespa crabro, Vespula vulgaris) and spiders (Anyphaena accentuate, Steatoda bipunctata, Araneus diadematus), and nest destroyers including the lesser wax moth (Achroia grisella). Kleptobionts such as ants (Formicidae) were also present. Accidental nest residents included saprophytic organisms like beetles (Tenebrionidae, Latridiidae), Dendrophilus punctatus, Dermestes Lardarius, springtails (Collembola), moths (Pheosia tremula), millipedes (Julus sp.), bristly millipedes (Polyxenus lagurus) and Oribatida mites. In total, the accompanying fauna included 22 species, 7 families, 1 genus, 1 order, and 2 classes. The findings indicate that some organisms traditionally seen as pests act as a “clean-up crew” in tree beehives. Moreover, wild beehives often serve as habitats for birds and small mammals, suggesting a demand for nesting sites in forests. While tree beehives contribute to forest biodiversity, potential food competition with other pollinators must be considered. Practical Implications for Beekeepers: Understanding the role of accompanying fauna can help forest managers foster biodiversity while mitigating potential conflicts between beekeepers and tree beekeepers.

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Tree beekeeping

- An old form of forest beekeeping, practiced from around the 14th century in Poland.
- Tree beekeeping was the first form of sustainable forest management in history that utilized natural resources without destroying them.
- Reasons for the end of beekeeping in Poland:
  - the intensification of agriculture,
  - the systematic clearing of forests for cultivation,
  - the development of industry.
- The last traditional beekeepers in the Białowieża Forest finished their activities in 1888.

https://www.zwiadowcahistorii.pl/filimon-waszkiewicz-ostatni-bartnik-bialowieski/

The last tree beekeeper from Białowieża Forest

The returned of tree beekeeping in Poland

- The return of beekeeping was initiated by the State Forests and non-governmental organizations involved in the protection of cultural heritage.
- The first project, "Restoring Tree beekeeping in Poland", began in the Spała Forest District, triggering a gradual revival of this tradition.
- The reactivation program covers various regions of Poland, including the Pilicka and Augustów Forests, the Białowieża Forest, and the Sudetes Forests.
- By 2023, over 1,000 new logs and approximately 100 new tree beehives had been established.
    - Main tasks of projects:
    - ✓ Carving tree beehives
    - ✓ Making traditional tools
    - ✓ Protection native ‚Augustowska bee' race
    - ✓ Enriching the forest with melliferous plants

Treebeekeeping
History Tradition Culture

From 2016 Tree-beekeeping (bartnictwo) has been included in part of *Intangible Cultural Heritage of Poland* according to UNESCO 2003 convention.

Tree beekeeping inscribed in 2020 on *the Representative List of the Intangible Cultural Heritage of Humanity*

What inhabits tree beehives?

A bee nest is attractive to many organisms that have different effects on the colony.

The presence of these organisms depend on hygiene.

In principle, tree beekeeping does not use:

impregnated wood

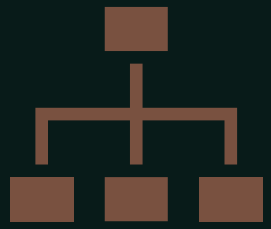
disinfectants

medications

Tree beekeeping allows the accompanying fauna to develop

Aim of study

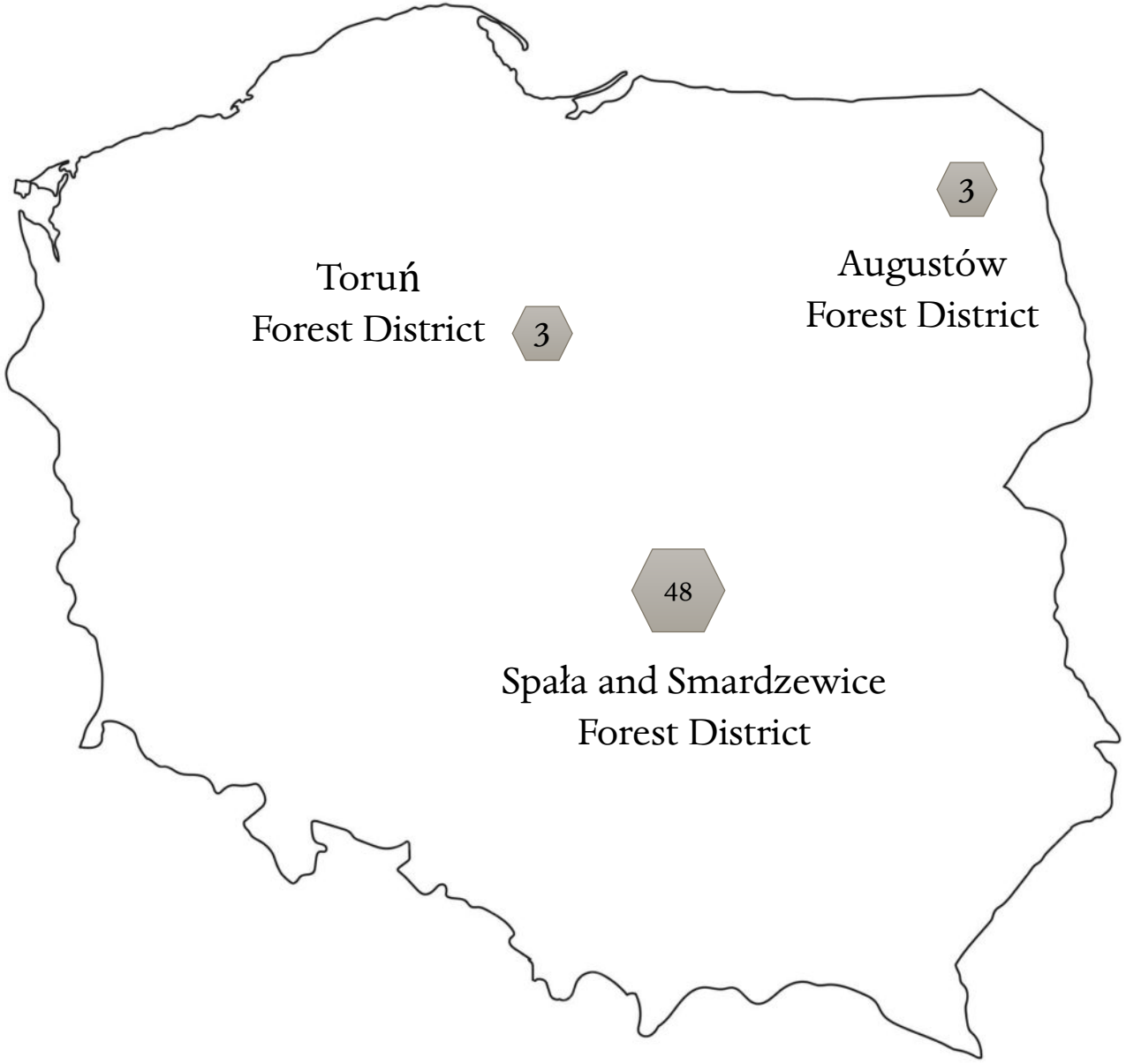
Identification of species accompanying honey bees in the tree beehives



Assessment of the harmfulness of fauna in relation to honeybees

Understanding the role of accompanying fauna in the biodiversity of forest ecosystem

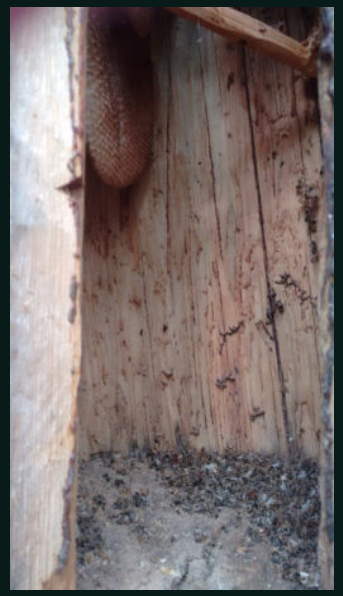
Research location



mapsland.com

Material and Methods

Sample collection time – 2018, 2022-2025
Samples from 54 bee nests were tested.
1 nest = 1 sample



dead bees from the bottom from the tree beehives

dust from the bottom

spider's webs and cocoons from the walls

combs

covering with branches and leaves

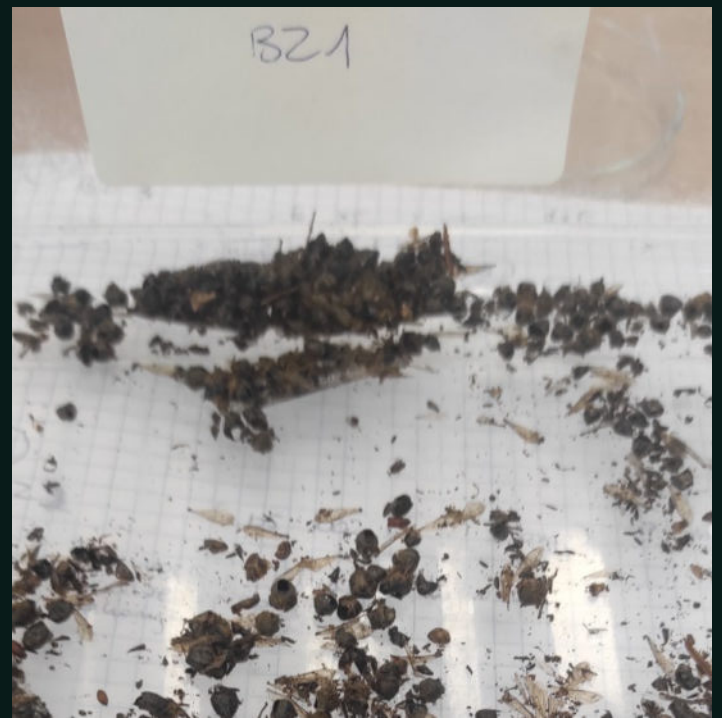
species in the tree beehive surroundings

Material and Methods

Material in various states of decomposition of organic matter

A stereoscopic microscope was used to search for fauna

Identification of species /families /orders



Division of accompanying fauna

Orders	15
Families	33
Species	50

Predators

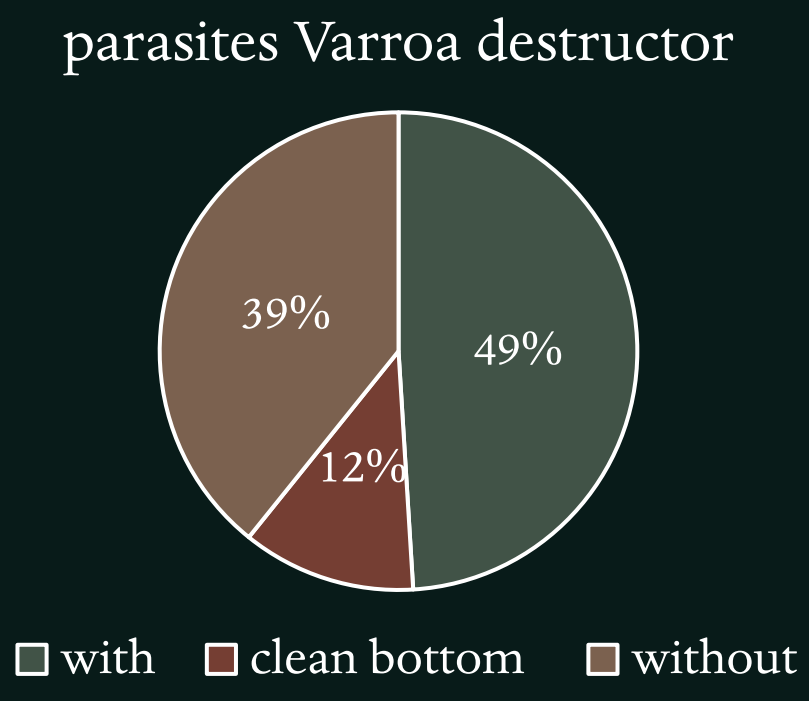
Cleptobionts

Parasites

Nest destroyers

Accidental nest residents

Fig. 1. Percentage of treebeehives with Varroa destructor and nest destroyers



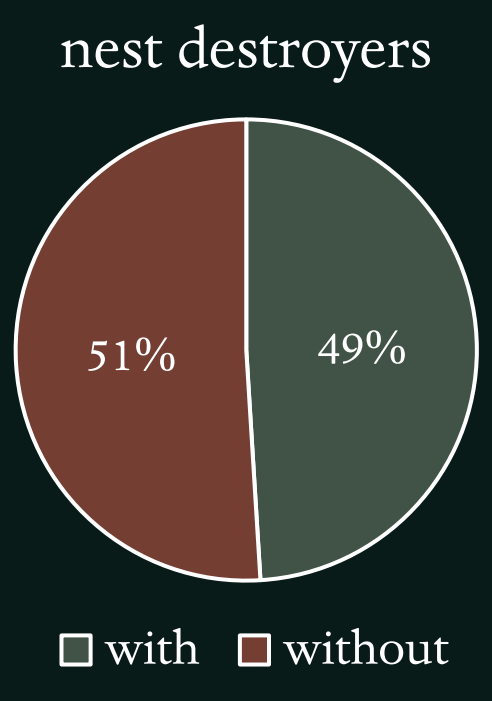
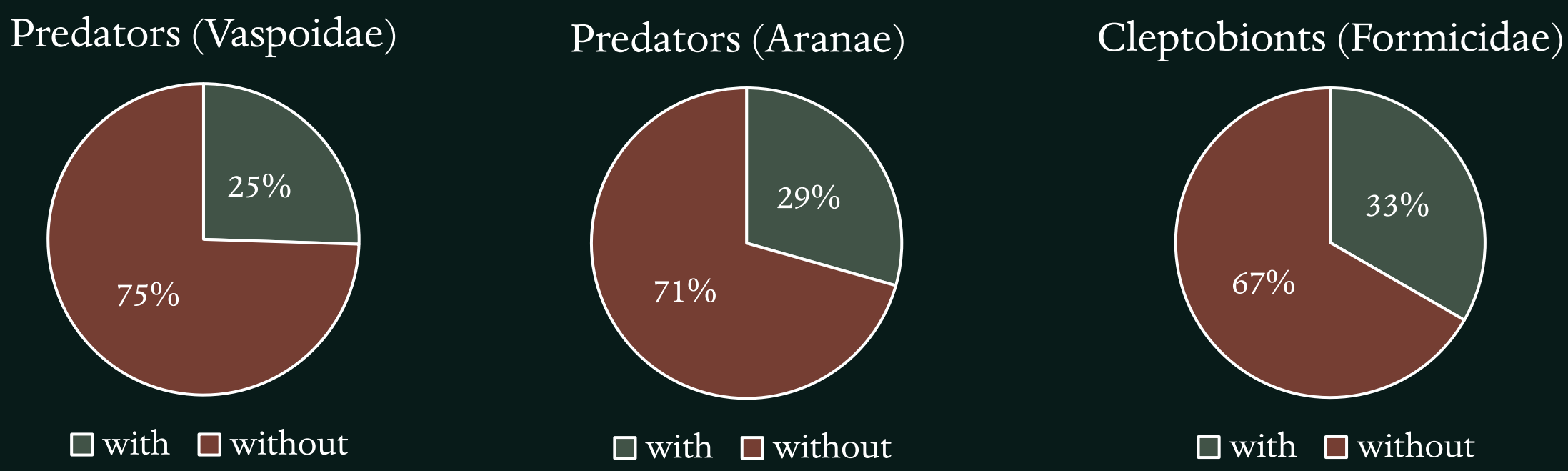


Fig. 1. Percentage of treebeehives with predators and cleptobionts



Accidental residents

Beatles

The remaining part of the accompanying fauna were saprophages organisms (related to the processing of dead organic matter) or other organisms that did not negatively affect the bee colony, defined as **accidental residents.**

Tenebrionidae	Dermestidae	Dermestidae	Histeridae	Lathridiidae	Throscidae	Ptinidae
Tenebrio sp.	*Dermestes lardarius*	*Megatoma sp.*	*Dendrophilus punctatus*	*Corticaria pubescens*	*Trixagus spp.*	*Pinus fur*
saprophages (plant, rotten, developing in dead wood infected with fungi synanthropic species	saprophages (animal products, seeds, pollen, dead insects)	saprophages a rare species	commensal in bird nests and anthills of *Formica rufa.*	synantrophic species (mouldy food of plant origin, various food products)	mycophage	Pollen, organic remains of plant and animal origin. Saprophagous larvae

Accidental residents

Others

saprophages (food – carrion, dead organic matter.	poliphagous	caterpillars feed on poplars, willows and birches	plant sap, honeydew producers	dead coniferous trees, algae and lichen	leaf litter or rotten wood, decomposition of organic matter
blowflies Calliphoridae	**Ectobius sp.**	***Pheosia tremula***	**Leafhoppers (Cicadellidae)**	**„Bristly millipede" (*Polyxenus lagurus*)**	**Millipedes (*Julus sp.*)**

Accidental residents

Others

Nesting traces

dead and decaying biological material (plant and animal), spores, fungis' mycelium, algae, pollen plant pests

Saprophages (food - mycelium, algae, lichens, bacteria, nematodes)

leaf litter or rotten wood, decomposition of organic matter, pests of garden plants

Red squirrel
Sciurus vulgaris

Eurasian hoopoe

Woodpecker
Picinae

Springtails (Collembola)

Oribatida Mites (Acari)

Pseudoscorpions

Rodentia

Pipistrellus pygmaeus

Summary

Can some pests be beneficial?

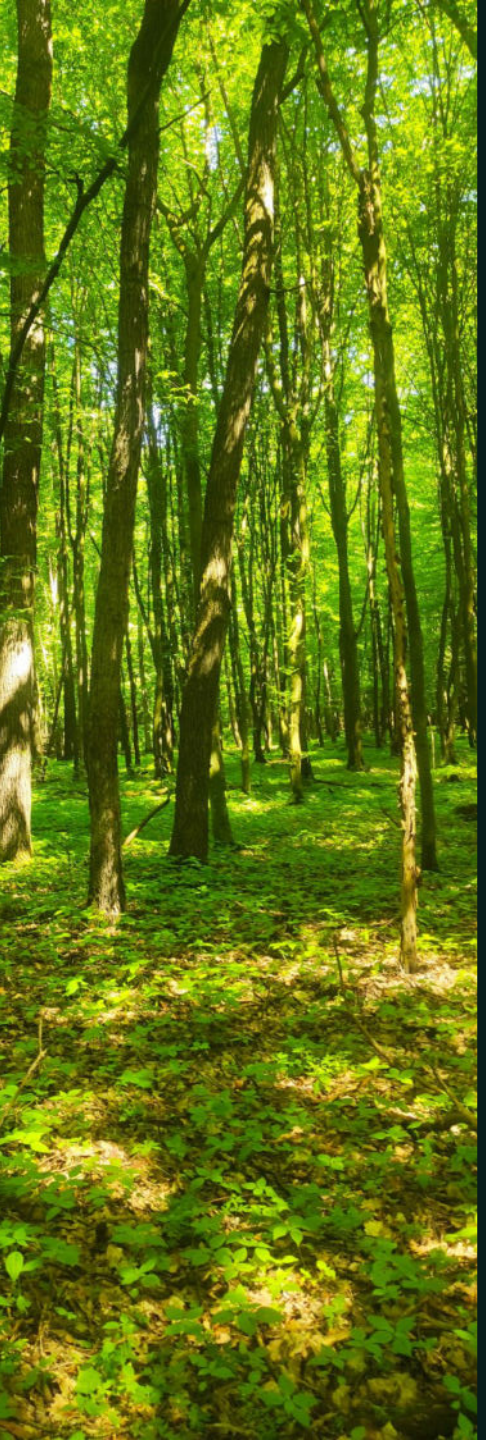
Can they be called a "cleaning up team" when the colony died?

- ✓ Animals associated with dead wood and the decomposition of dead organic matter live in tree-beehives, which cannot be observed in hives
- ✓ Useful organisms develop in tree beehives

Nests for other hymenopterans

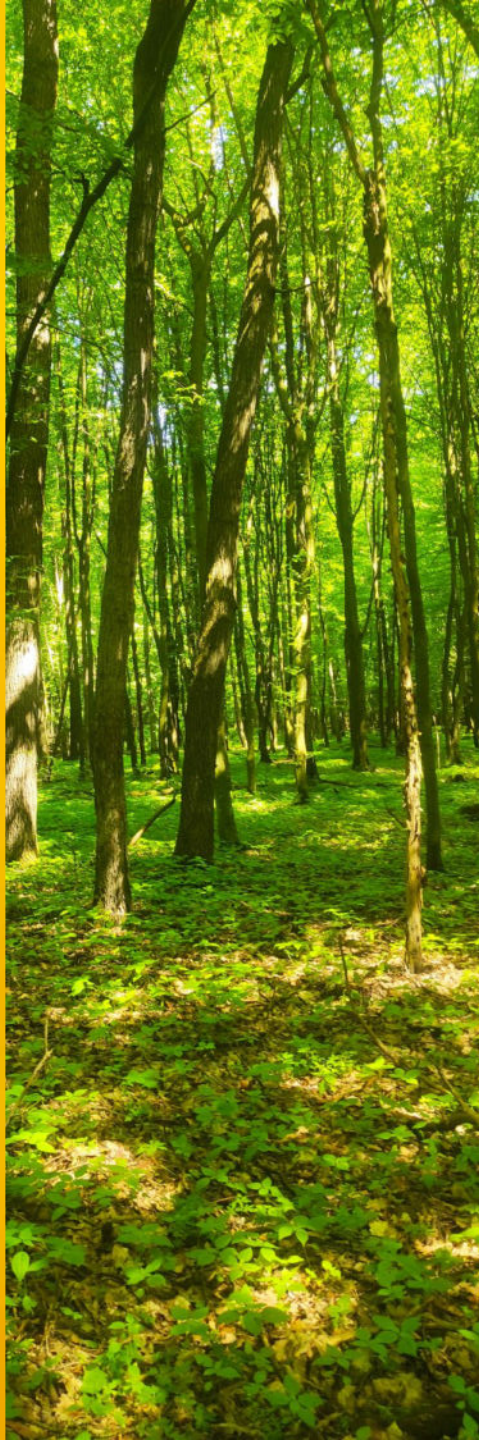
Pests are food for othe animals

Lesser wax making room for new swarm



Tree beekeeping
harmonious cooperation between humans and nature

Advantages of modern beekeeping:

- a model of sustainable development
- preventing biodiversity loss
- contributing to the development of knowledge about bee ecology

Thank you
for your attention!