

Ecological characteristics of mushroom mite assemblages in temperate deciduous forests

Dead wood is a resource for many organisms



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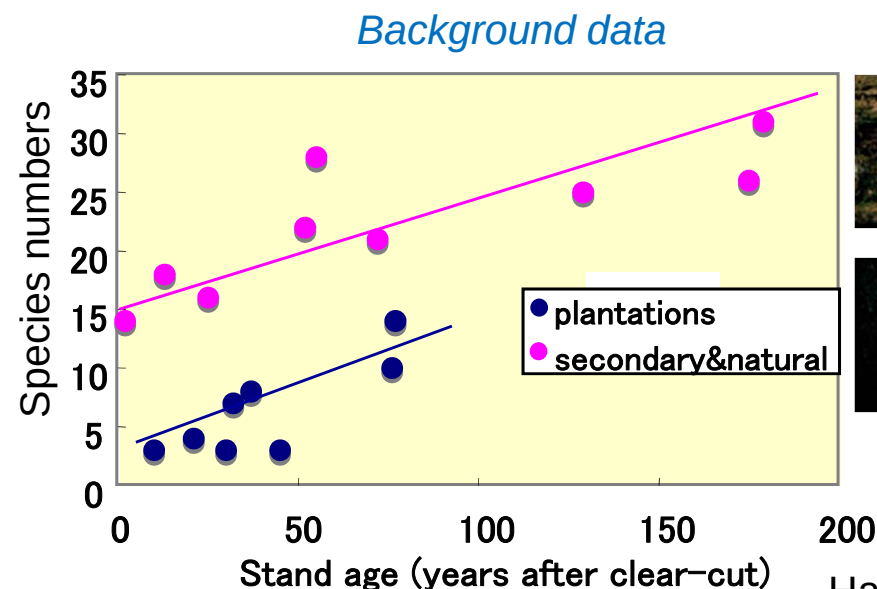
Objectives of this study

To determine:

1. Effects of habitat diversity (mushroom richness) for inhabitants (mites),
2. Importance of habitat connectivity for mites,

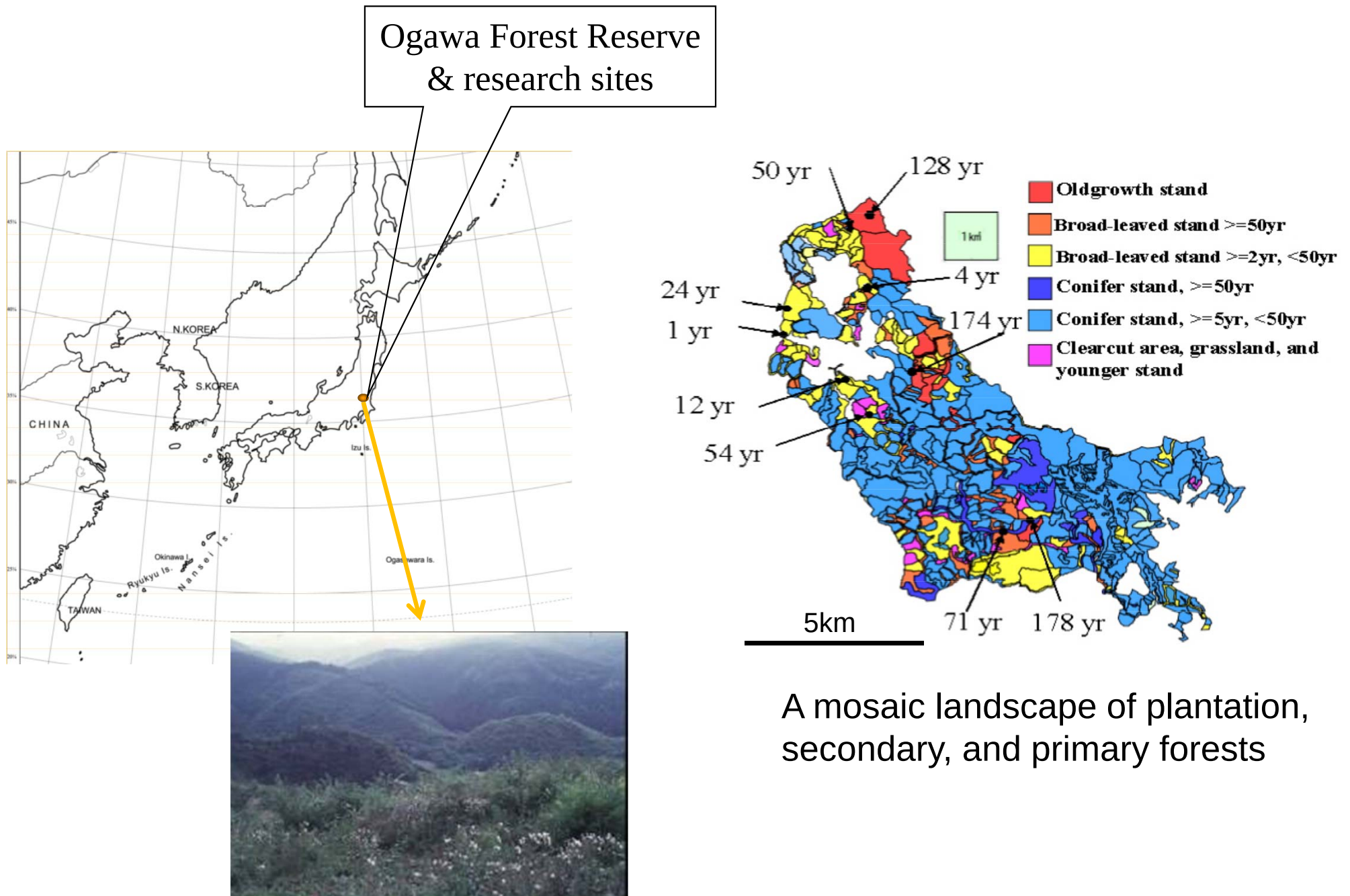
To address the question:

3. Can dead wood be an indicator of forest biodiversity, especially for fungi and associated animal communities?



Hattori et al (unpublished)

Materials and Methods : study sites



Materials and Methods : mushroom mite sampling



Ephemeral fruiting bodies

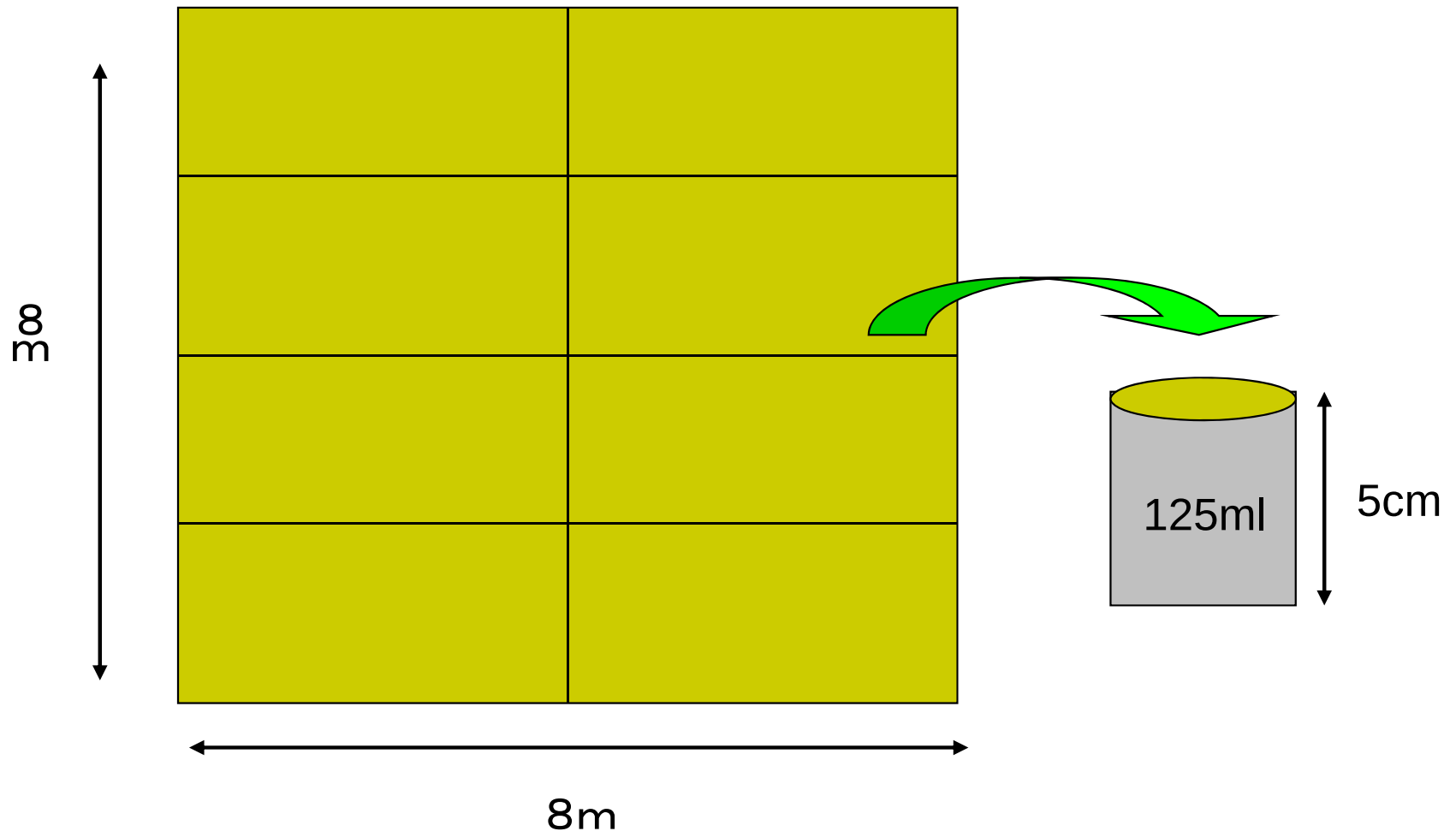


Long-lasting fruiting bodies
e.g. bracket fungi



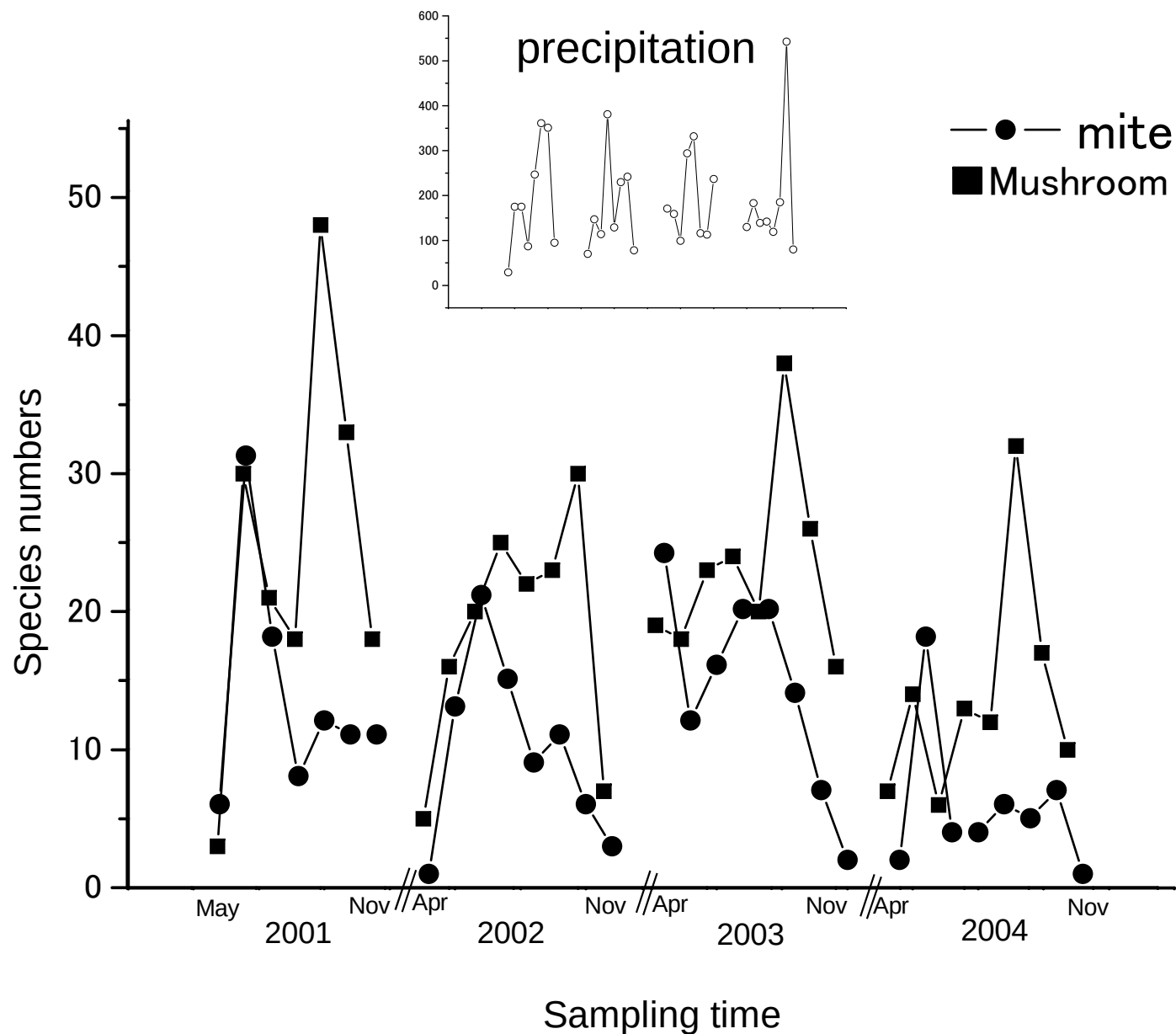
- Line census & sampling of mushrooms on 10x100 m plots in 7 different stands in 2003 & an old growth forest in 2001-04 between April and November.
- Hand sorting of mites from samples.

Materials and Methods : soil mite sampling



Quadrature sampling of soil in 7 stands and mite sampling from each soil sample to compare with mushroom samples.

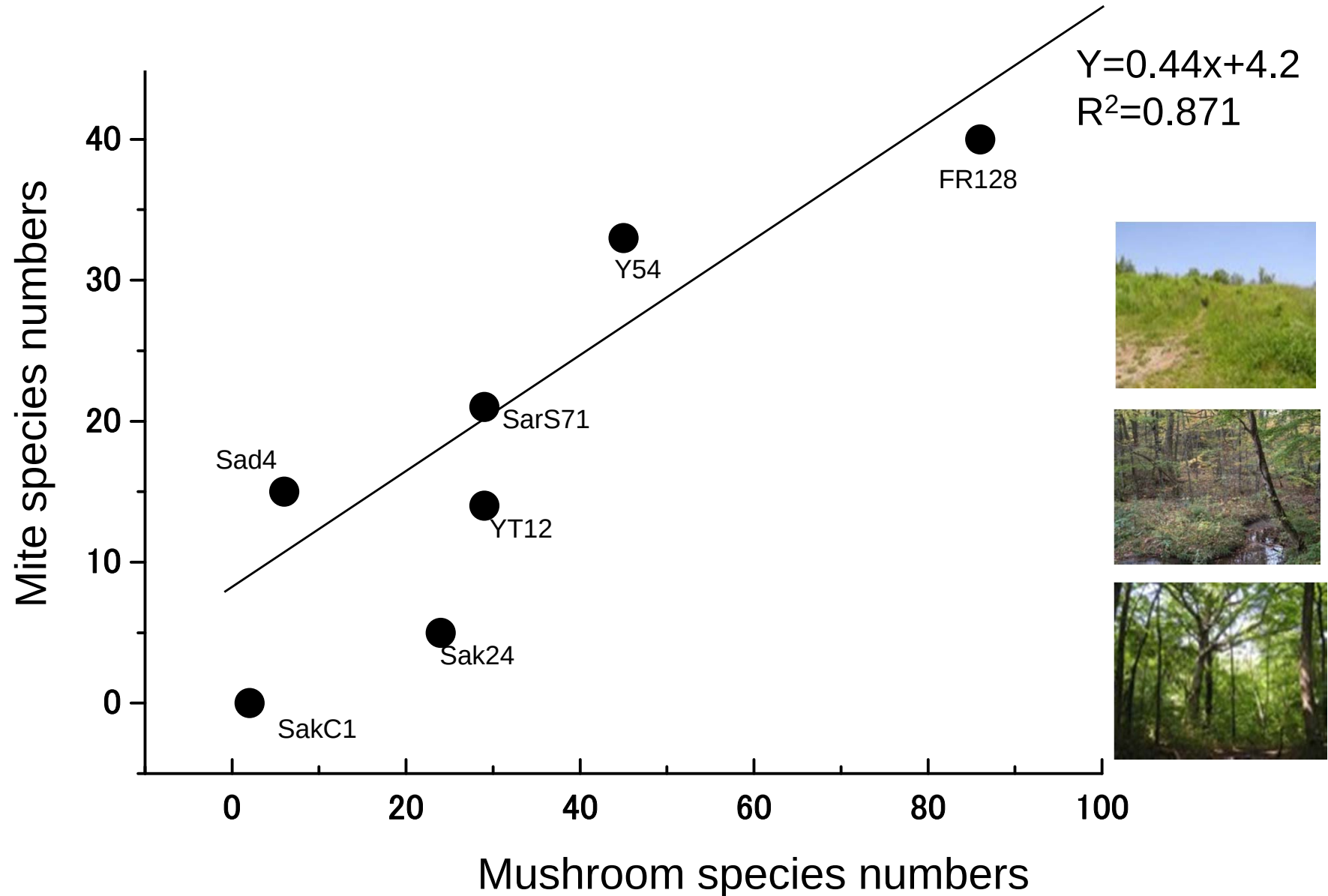
Results: mushroom and mite species richness



Mite species richness was correlated with mushroom diversity per sampling in the old growth forest (GLM, $P = 0.0198$). Mushrooms=150spp, mites=124spp.

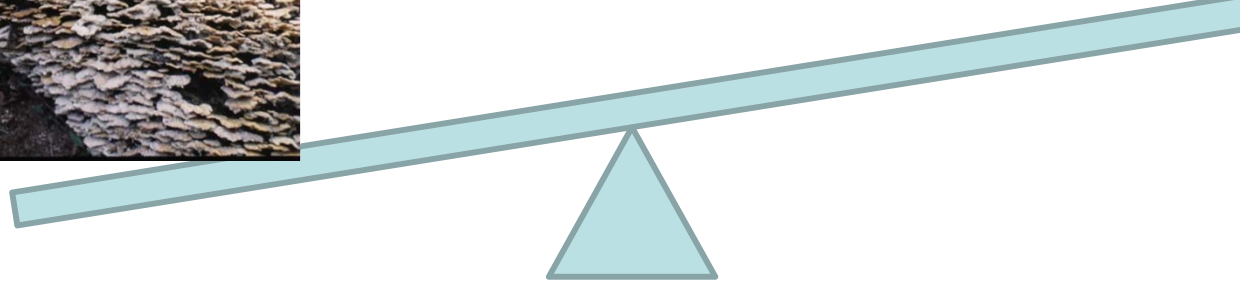
Results: mushroom and mite species richness

Correlation between mushrooms and mites in deciduous forests



Results: species richness or certain species

More mite species

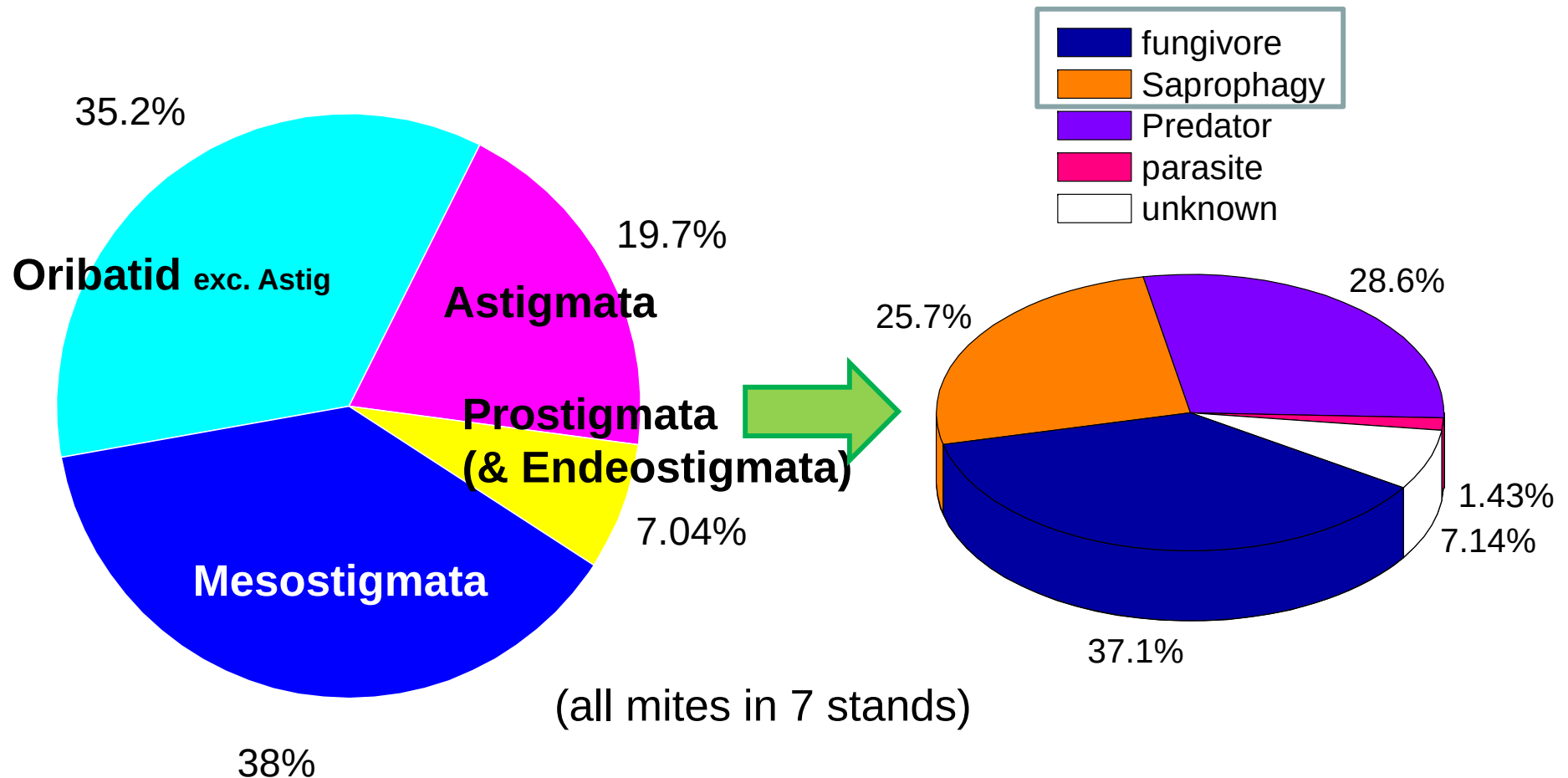


There was no correlation between mushroom size and mite species richness (GLM, $P = 0.0629$).

More mite species were collected from fungi with long-last fruiting bodies (e.g. bracket fungi) than from those with ephemeral (e.g. agaricales fungi) (X^2 test, $P < 0.00$; long-last=333samples, ephemeral=268samples) .

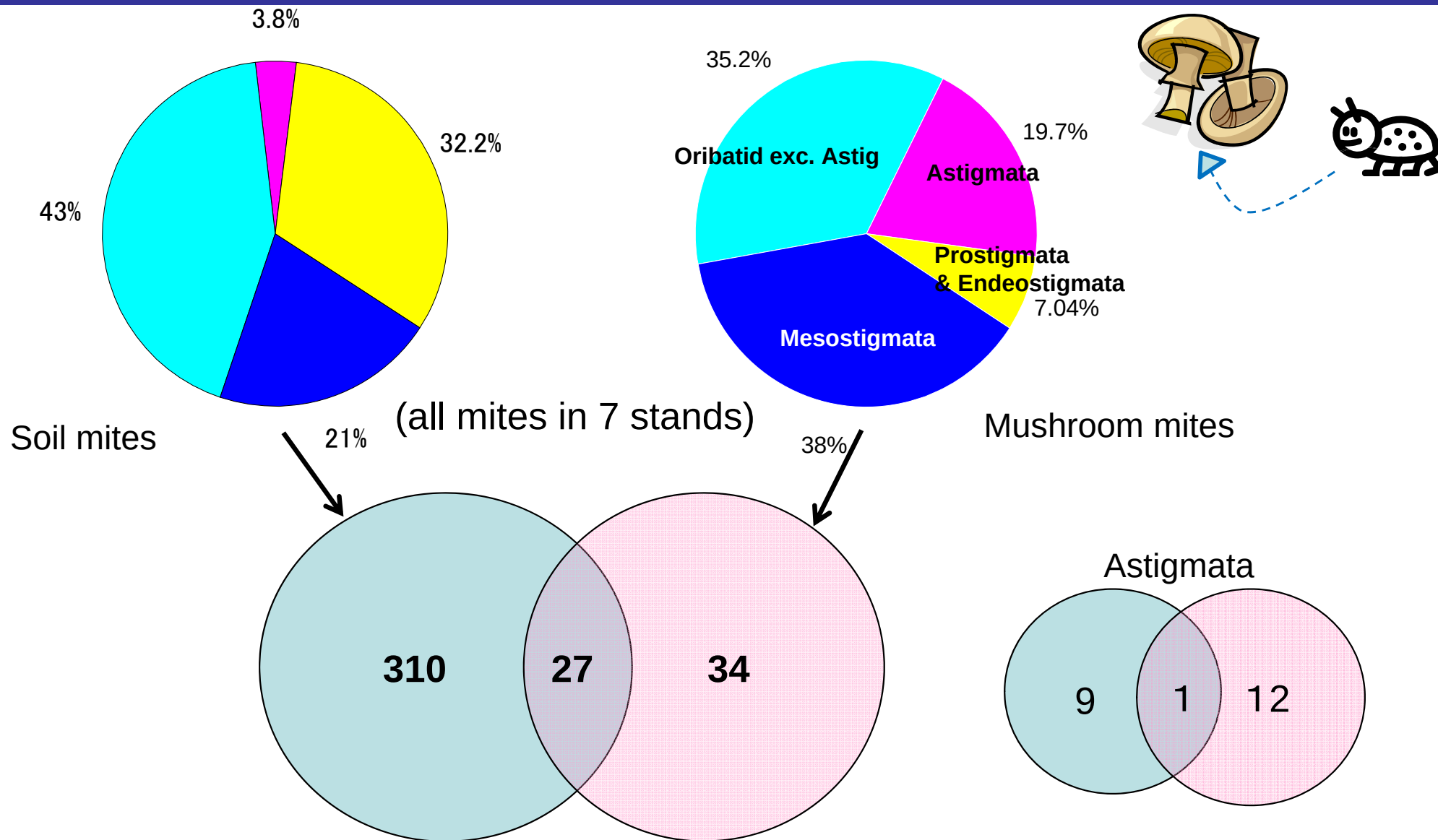
Therefore, dead wood is important resources to maintain organisms such as mushroom mites and can be used as a surrogate indicator.

Results: structure of mushroom mite community



1. Most mites on mushrooms are decomposers of fruiting bodies (fungivores & saprophagy) and maybe dispersers of mushroom spores.
2. There are natural enemies of arthropods and nematodes inhabiting mushrooms.

Results: how mites reached mushrooms

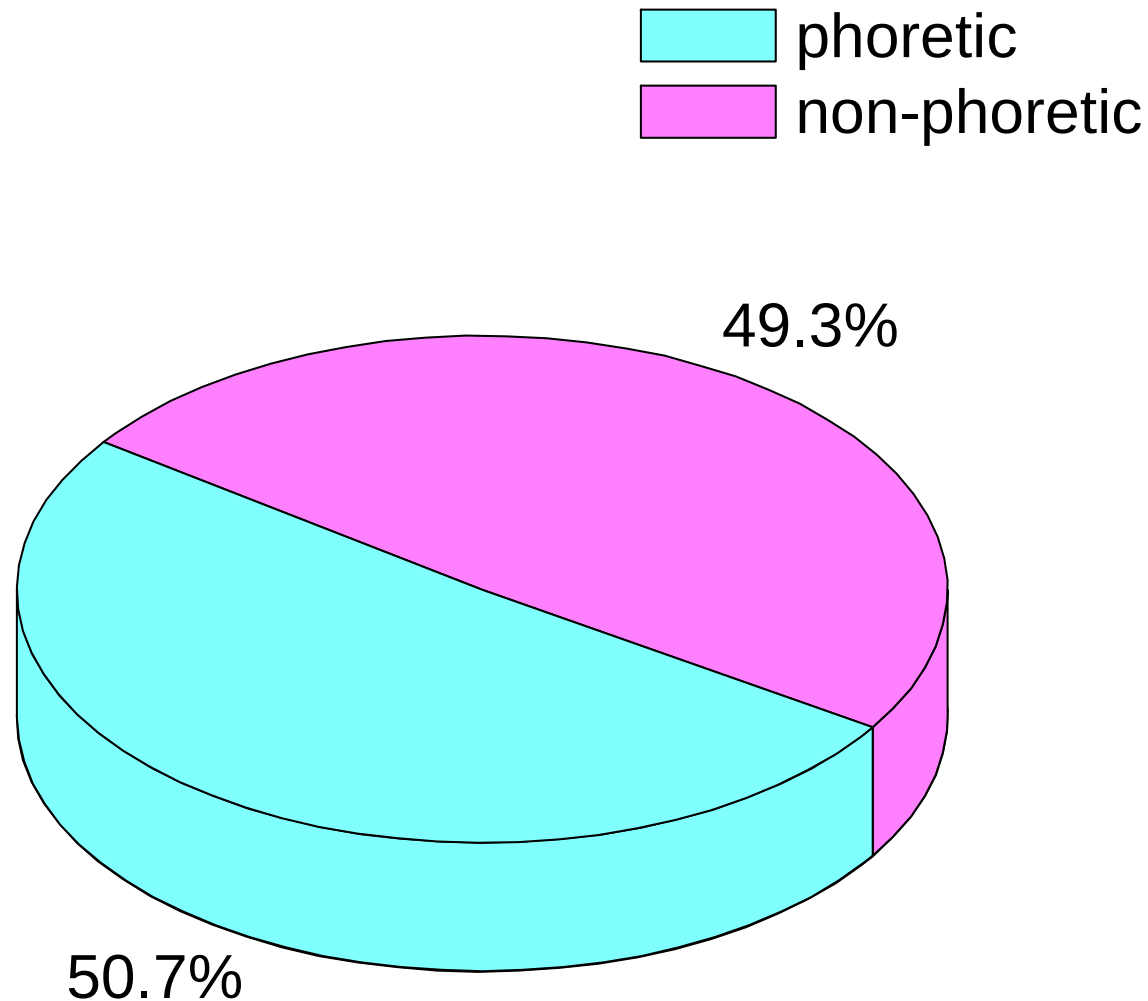


1. Only a half of mushroom mites might come to fruiting bodies from soil.
2. Astigmatids demonstrated different species composition between soil and mushrooms.

Results: how mites reached mushrooms

Mite dispersal

- phoresy
- air
- walking
- others



- 1) Our other study (e.g. Sueyoshi and Okabe 2007) showed flies and beetles were important vectors for mushroom mites.
 - 2) For mites, beetles are good phoretic hosts, prob. because of their dispersal ability.
 - 3) Beetles prefer bracket fungi to ephemeral fruiting bodies.
- These suggest a part of mite community depends on insects associated with mushrooms and dead wood.

Conclusions

1. Mites function as decomposers of fruiting bodies, may be spore dispersers, and natural enemies of mushroom inhabitants (e.g., some flies, bacteria, and nematodes).
2. Mushrooms on dead wood, particularly bracket fungi contribute to total mite species richness.
3. Probably, insects inhabiting dead wood are important dispersal agents of mushroom mites.
4. Therefore, dead wood can be a surrogate indicator but to use them as an indicator, ecological roles of dead wood should be better clarified (e.g., dead wood age and mushroom succession, functions of mushroom inhabitants, animal and fungal communities on dead wood...).