

# Effect of species composition and stand age on spider (Araneae) and harvestmen (Opiliones) communities in Scottish managed plantations



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## Overview

- Fast afforestation rate in Scotland for timber production (21% by 2032) but unknown effects on arachnid community<sup>1</sup>.
- Norway (*Picea abies*) and Sitka spruce (*Picea sitchensis*) plantations are generally homogenous systems unlike Scots pine (*Pinus sylvestris*) native forests<sup>2</sup>.

## Research questions

- 1 Investigate whether arachnid richness differs between Scots pine and spruce mixture plantations
- 2 Investigate what variables drive richness in arachnid assemblages between habitats

## Methods

- Falkland Estate, Fife, Scotland (Fig.1)
- Arachnid sampling: pitfall trap and litter sieving May – Jul 2022
- Environmental sampling: vegetation richness & cover at 3 vertical layers, canopy openness, soil pH, litter depth, surface collembolan abundance
- 701 spiders > 53 species > 10 families
- 219 harvestmen > 7 species > 3 families

### Analysis:

- multiple linear regression, PCA

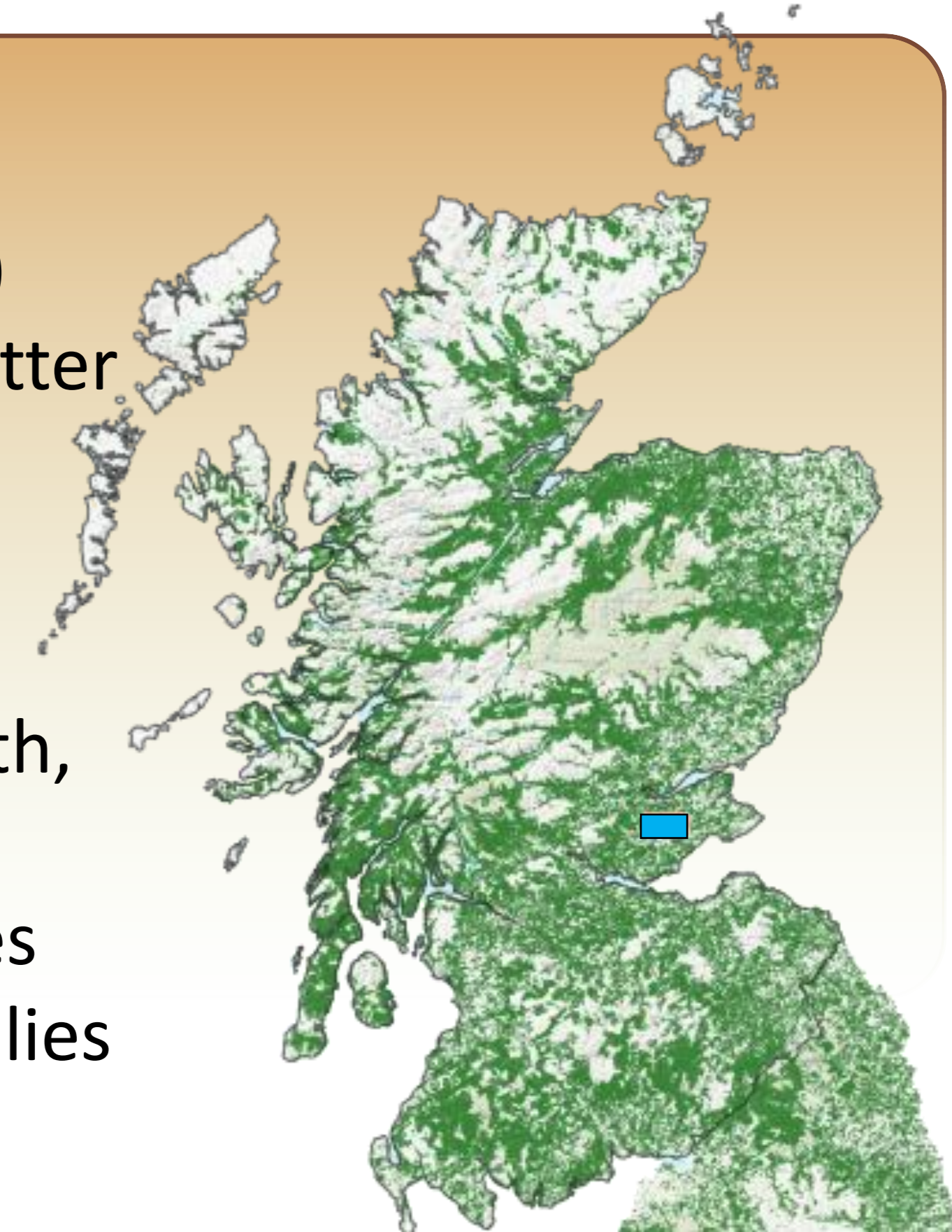


Fig. 1: The extent of forestry in Scotland. Study site in blue.

## Results

### Spiders

There was a strong significant difference in mature spruce and Scots pine spider species richness ( $t=-5.69$ ,  $df=74$ ,  $70$ ,  $***P<0.001$ ,  $n=25$ ). No effect was found between young spruce and Scots pine spider richness (Fig.2a). Overall, Collembola abundance and soil pH explained 41.0% of the variation in spider richness ( $F(4,70)=13.89$ ,  $***P<0.001$ ) between habitats.

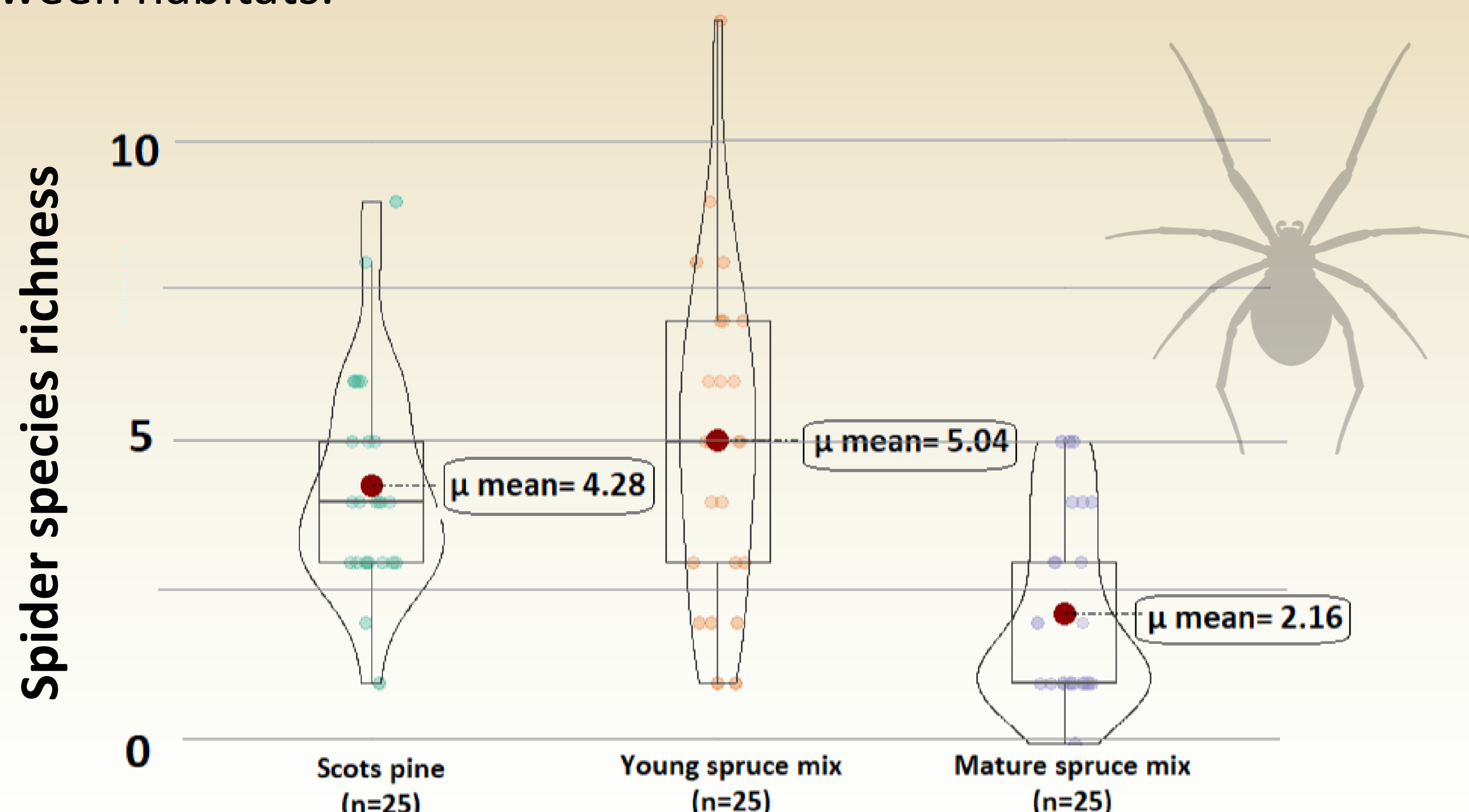


Fig. 2a: Spider species richness between the three habitats

## Results

### Harvestmen

No significant difference were found in harvestmen family richness between Scots pine and young spruce ( $z=1.41$ ,  $df=74$ ,  $72$ ,  $P>0.05$ ,  $n=25$ ) or Scots pine and mature spruce ( $z=1.19$ ,  $df=74$ ,  $72$ ,  $P>0.05$ ,  $n=25$ ) (Fig. 2b). **PCA:** Nemastomatid and Phalangiid harvestmen clustered more towards higher pH soils with high Collembolan density and high ground vegetation cover. Sclerosomatid harvestmen clustered more towards mature spruce with dense, closed canopy and low vegetation cover.

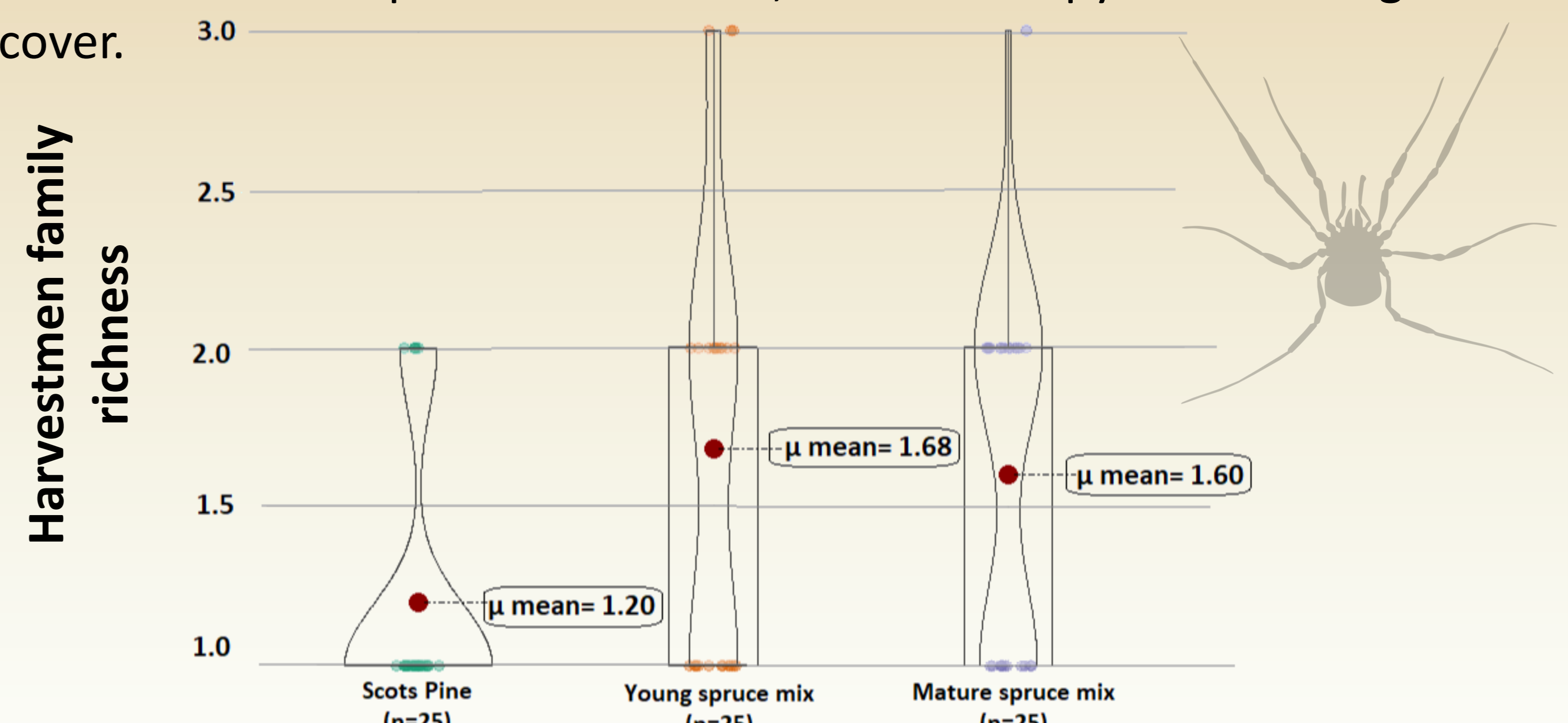


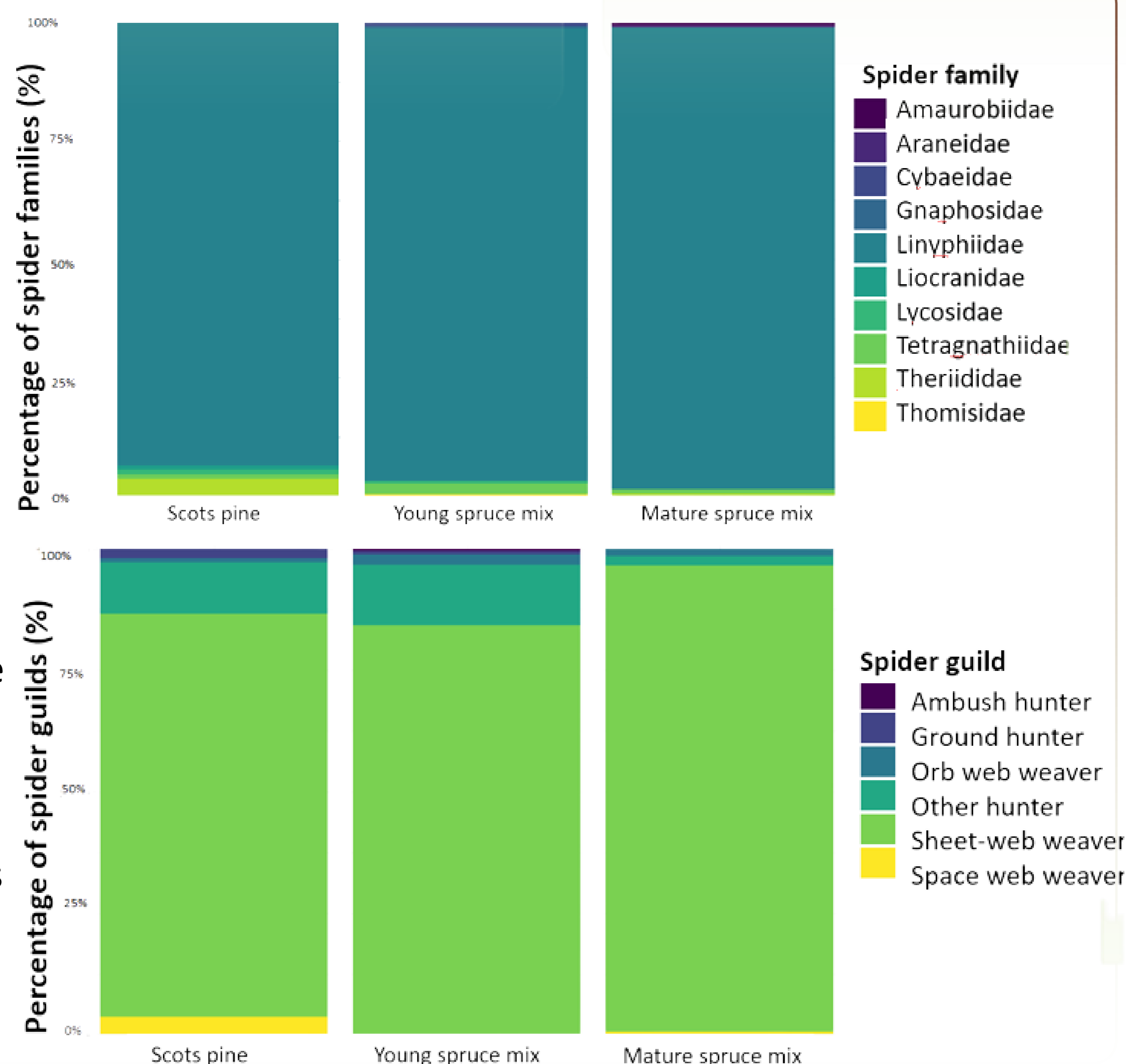
Fig. 2b: Harvestmen species richness between the three habitats

## Discussion

The high spider richness in young spruce could be explained by edge effect – Lycosids as an epigeic, group could disperse and colonise from adjacent environments<sup>3</sup>, thus contributing to species richness.

Considering harvestmen sensitivity to dehydration, it is possible Sclerosomatid harvestmen preferred closed canopy covers due to microclimatic buffering in mature spruce stands<sup>4</sup>.

More complementary sampling is needed to target other spider guilds including vegetation dwelling spiders, and seasonal sampling to increase harvestmen sample size.



## Conclusion

Spruce plantations can have natural predator richness comparable with native forest systems. Practitioners must follow a holistic ecosystem approach to timber production, maintaining a mosaic of age stands during forest cycle.

### Acknowledgements

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### References

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