Recent mass outbreak of *Agrilus biguttatus* associated with local oak decline following drought and heat in South-East Germany

Evidence, observations, and management implications

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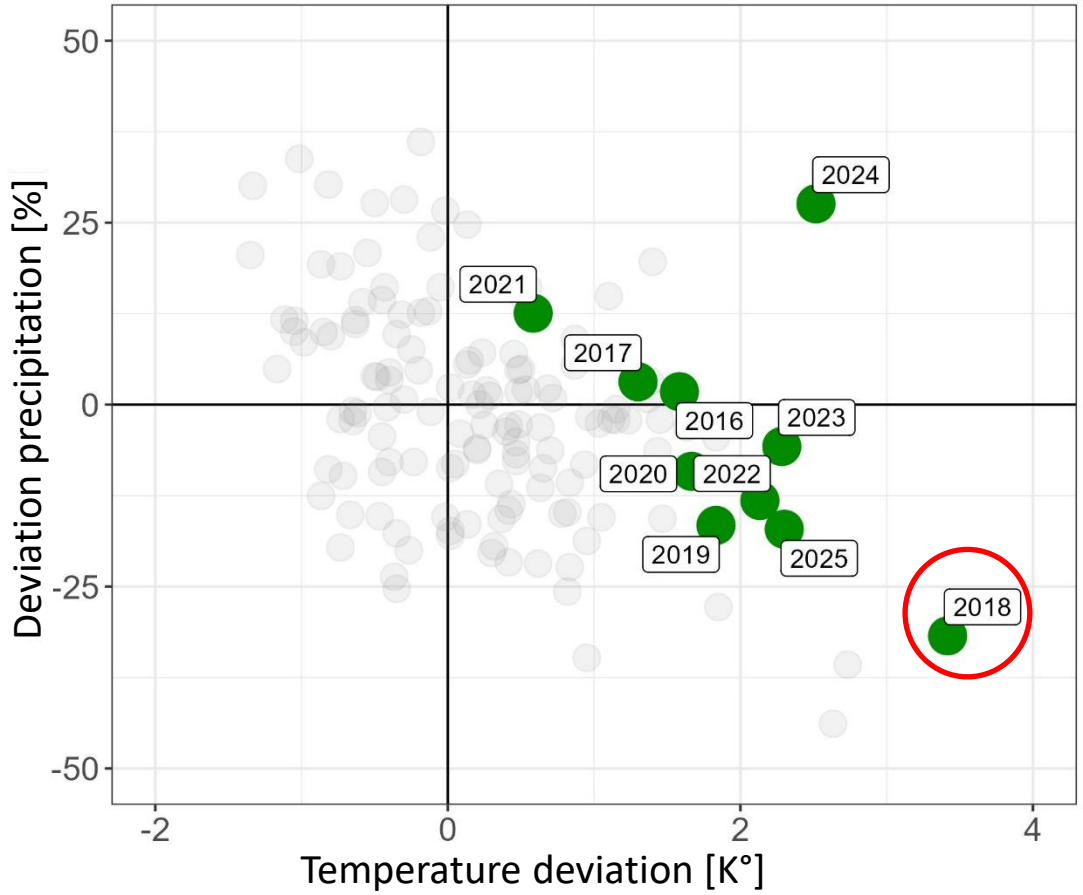
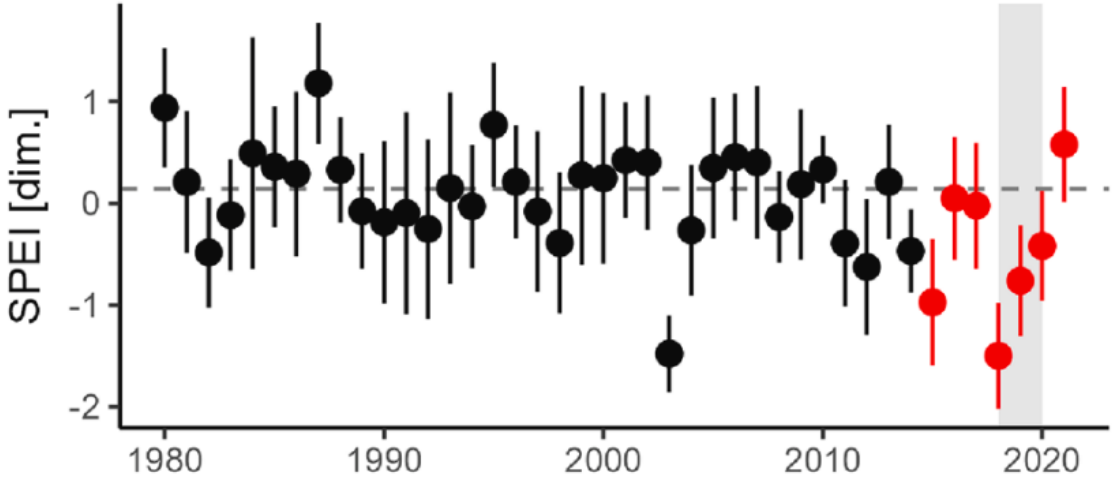
BAYERISCHE FORSTVERWALTUNG

ZENTRUM WALD FORST HOLZ WEIHENSTEPHAN

Recent climate – perfect conditions for insects?

Deviation from the long-term average during the growing season
Reference periode 1961 to 1990





Potterf et al. 2025, https://doi.org/10.1016/j.foreco.2025.122615

Data source: German Weather and Climate Service (DWD), Fig.: H. Lemme (LWF)

Impressions from oak stands (*Q. robur, Q. petraea*)


T. Frühbrodt (LWF)

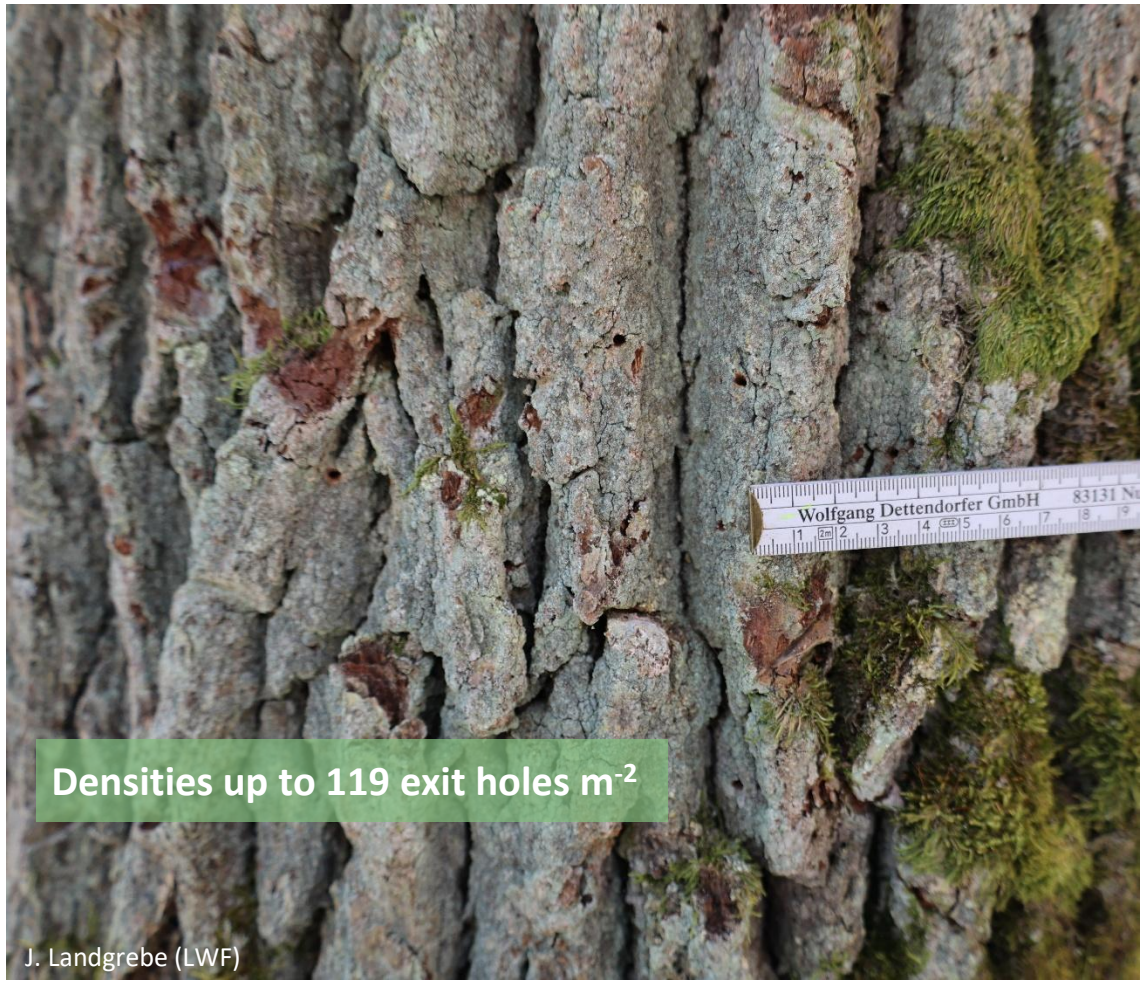

T. Frühbrodt (LWF)


Infestations also on trees with relatively better crown vitality

S. Terzenbach (LWF)


T. Frühbrodt (LWF)

A. biguttatus exit holes in sometimes great density



Densities up to 119 exit holes m^{-2}

J. Landgrebe (LWF)

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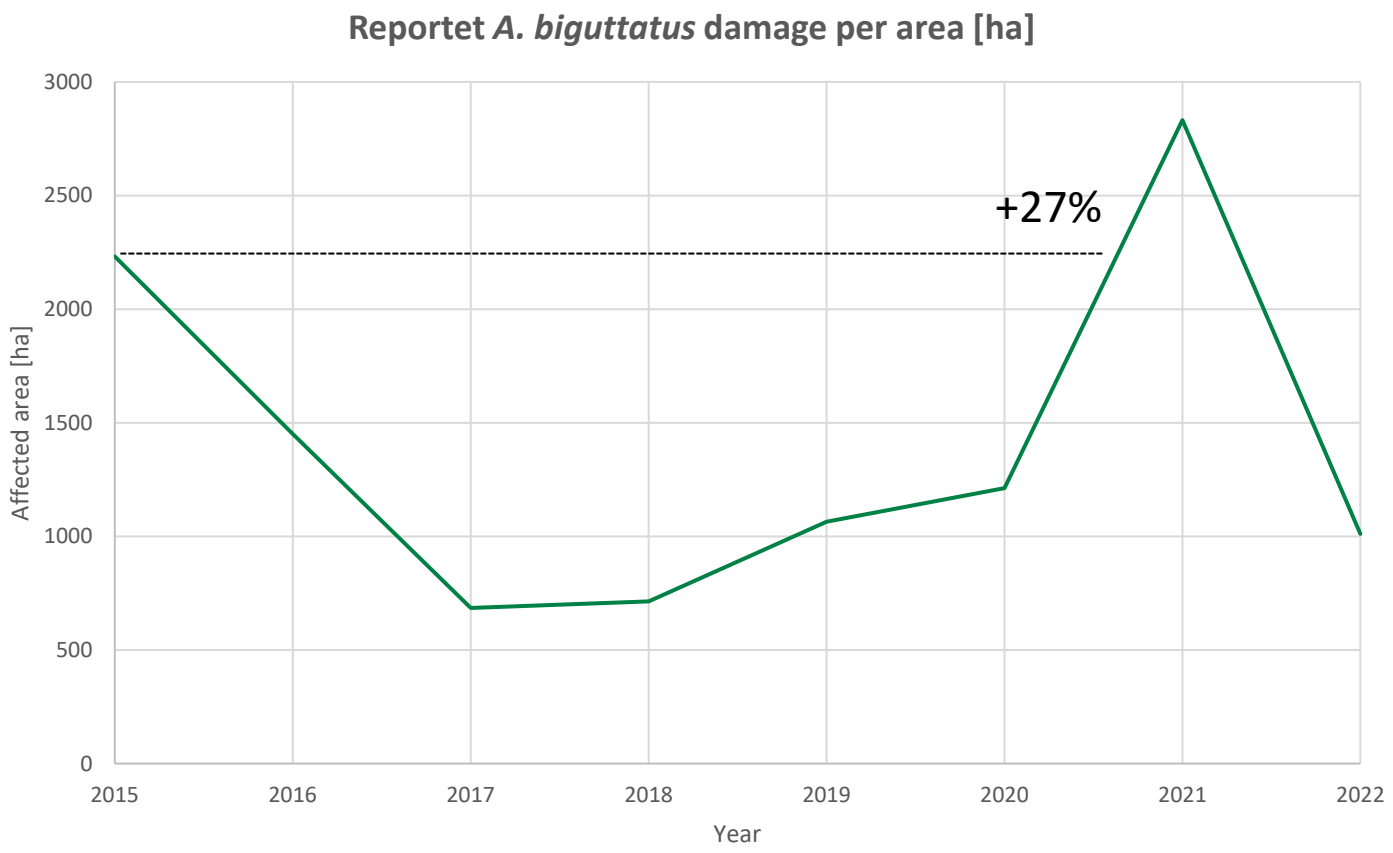
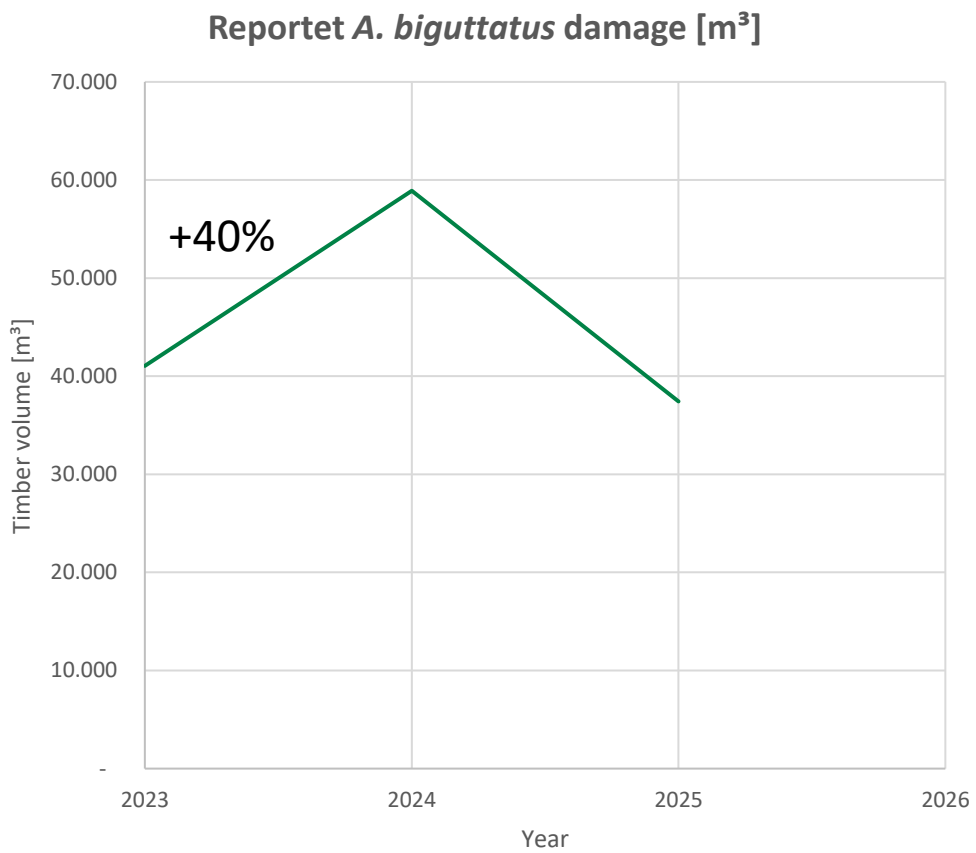
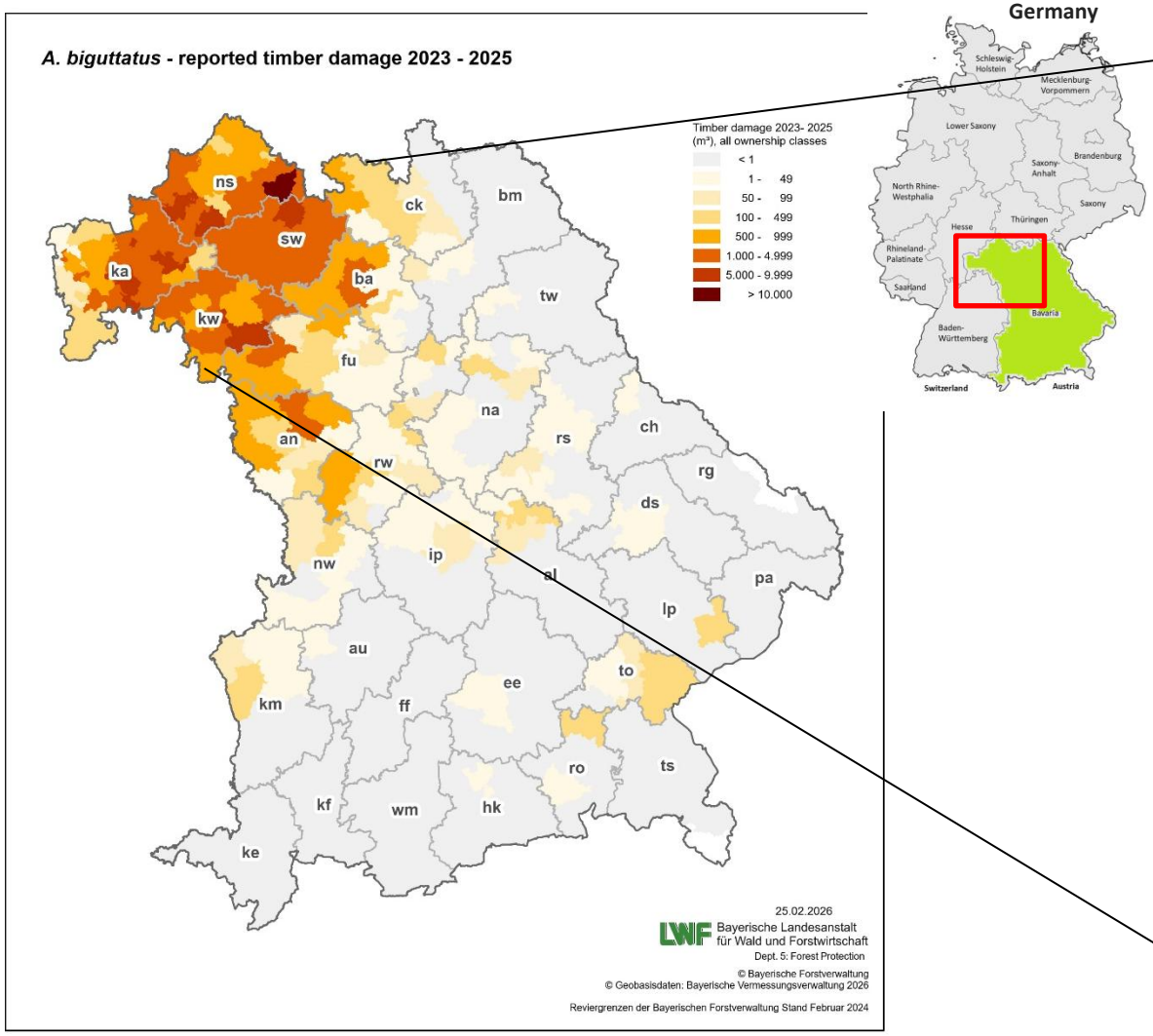
Reported timber damages in Bavaria associated with *A. biguttatus*

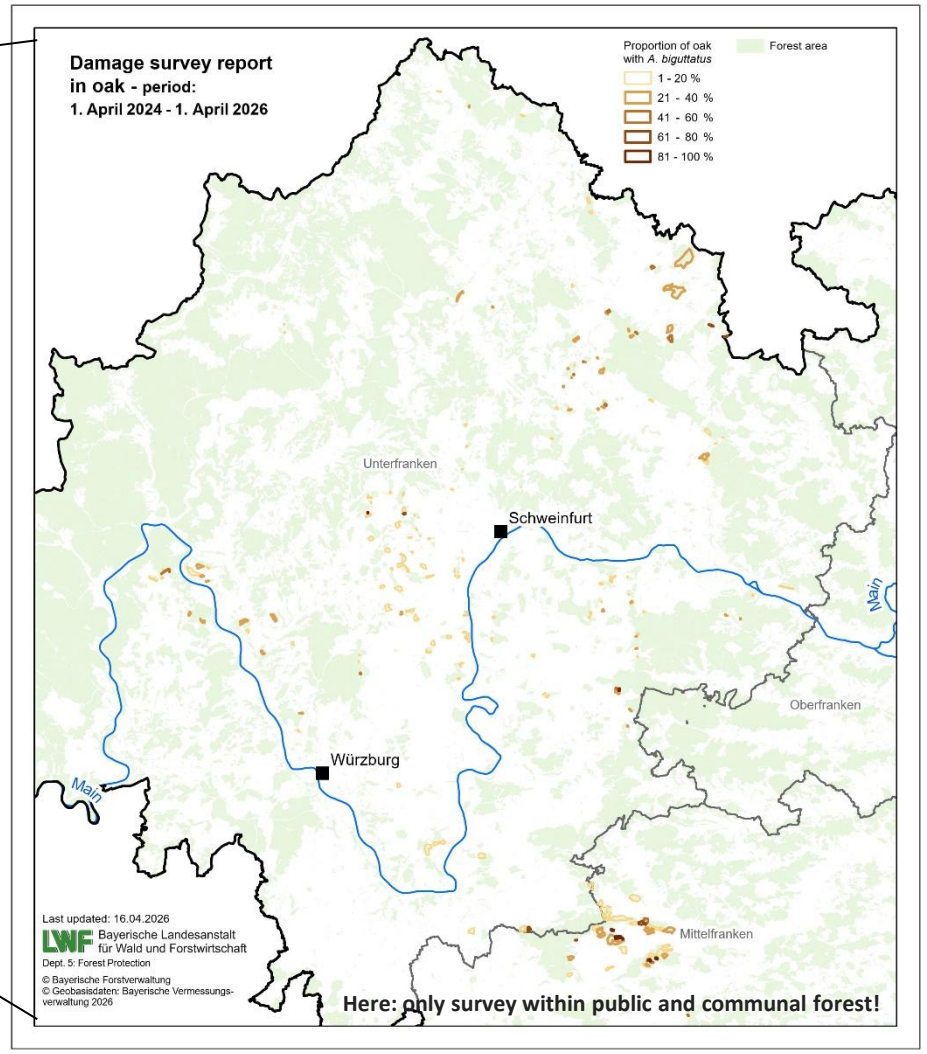




Data: Forest Damage Survey (LWF)

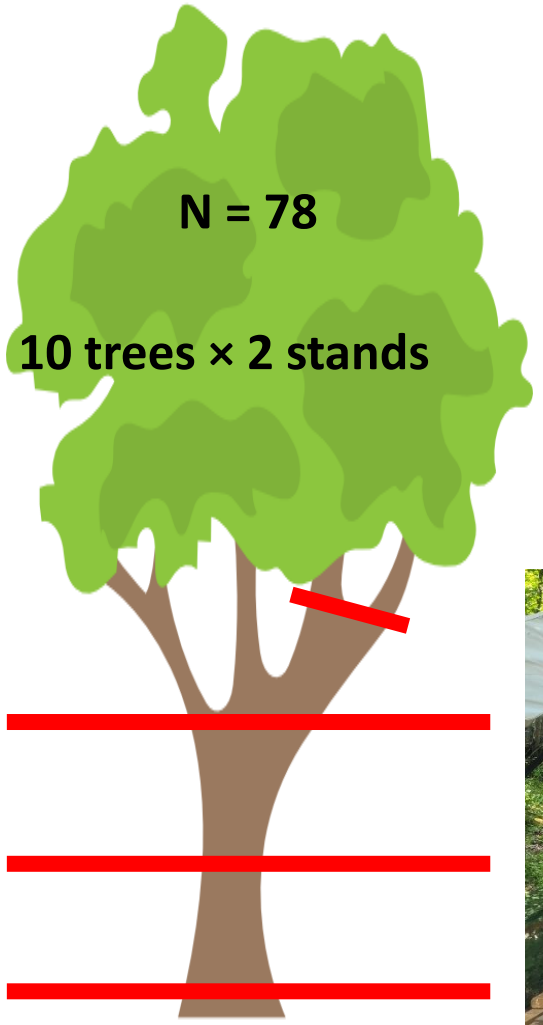
Spatial distribution of damages





Maps: B. Hausknecht (LWF)

Systematic assessment of insect community associated with local oak decline



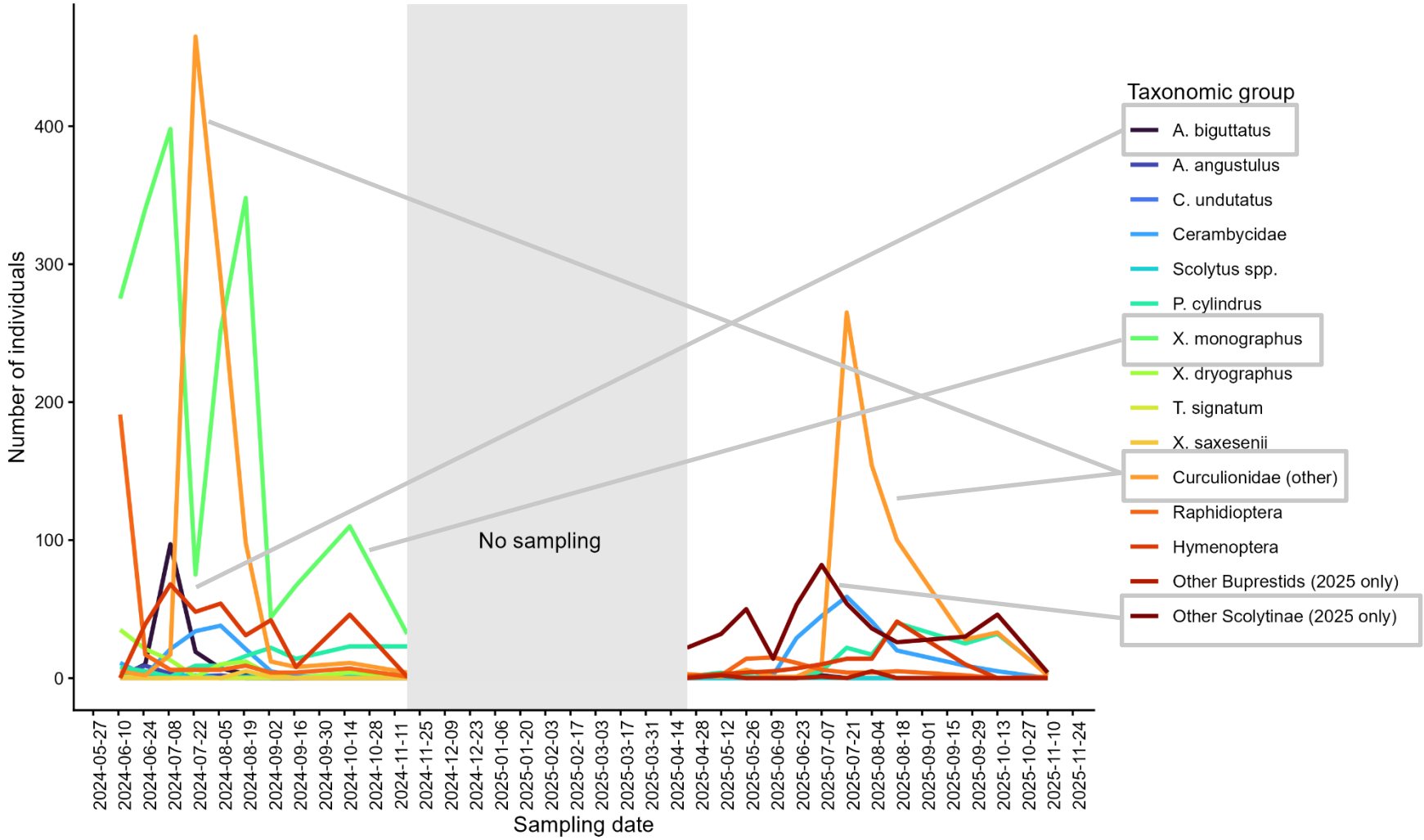
Main research questions:

- **Who: Which species?**
  Relative importance of *A. biguttatus* vs. other species
- **Where: In which part of the tree?**
  Vertical distribution within trees?
- **When: Who is emerging when?**
  Chronology of emergence of associated species
- **Relation of insect communities with observed tree symptoms**


J. Landgrebe,LWF

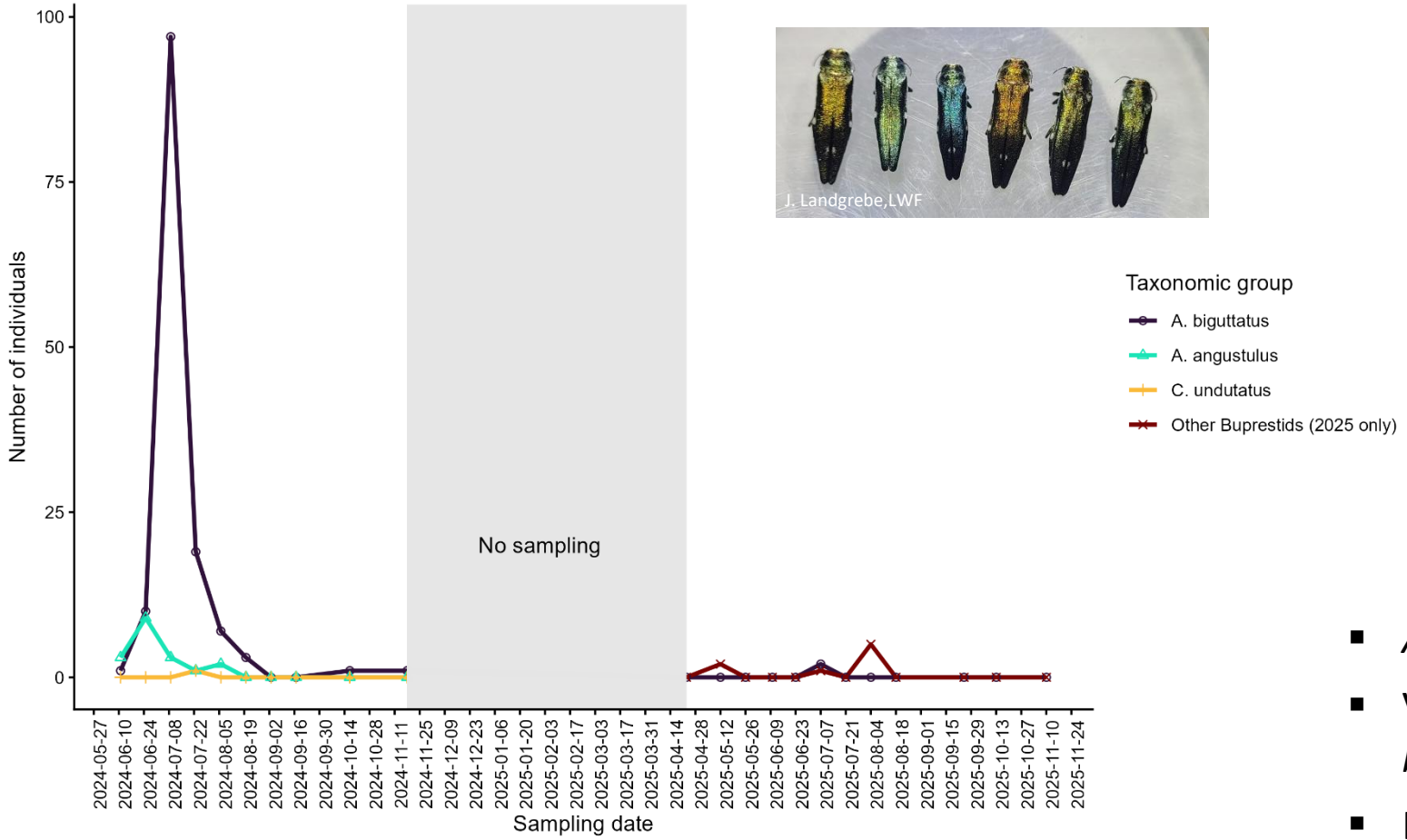

S. Ulitzka ,LWF

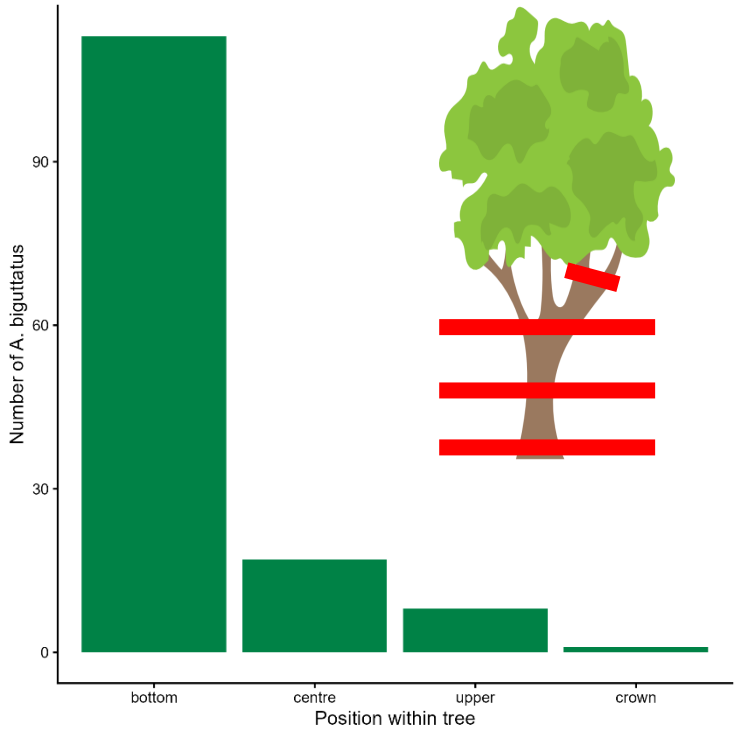
Insect catches over time



- Broad spectrum of species
- Some taxa of noticeable abundance
- Buprestids only in year 1 after felling

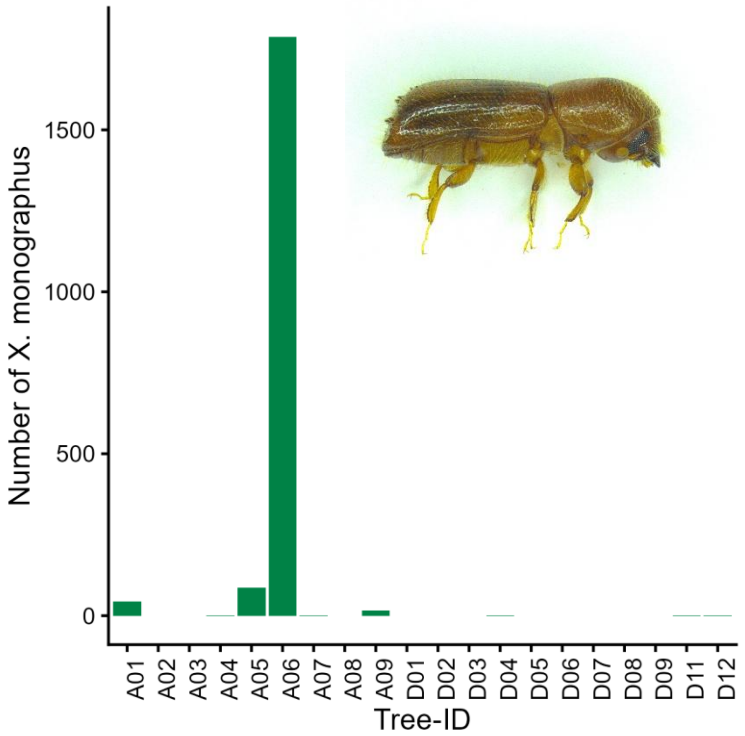
A. Biguttatus was most abundant Buprestid

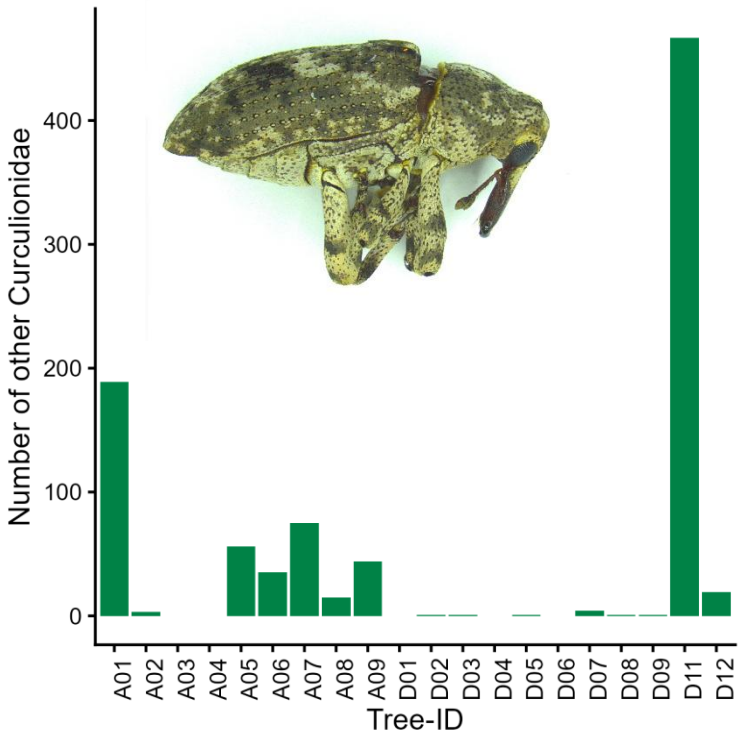




- *A. biguttatus* most abundant: 129 vs. 18
- Very synchronous emergence of *A. biguttatus*
- Important abundance at lower stem sections

Other relevant taxa





- *X. monographus*: abundant, but only in a few trees

- *Gasterocercus depressirostris:* noticeable abundance, also beyond the study sites
- Formerly rare relict species, seems to profit from altered climatic conditions and dead wood retention?
- Relevance for oak mortality uncertain!

LWF

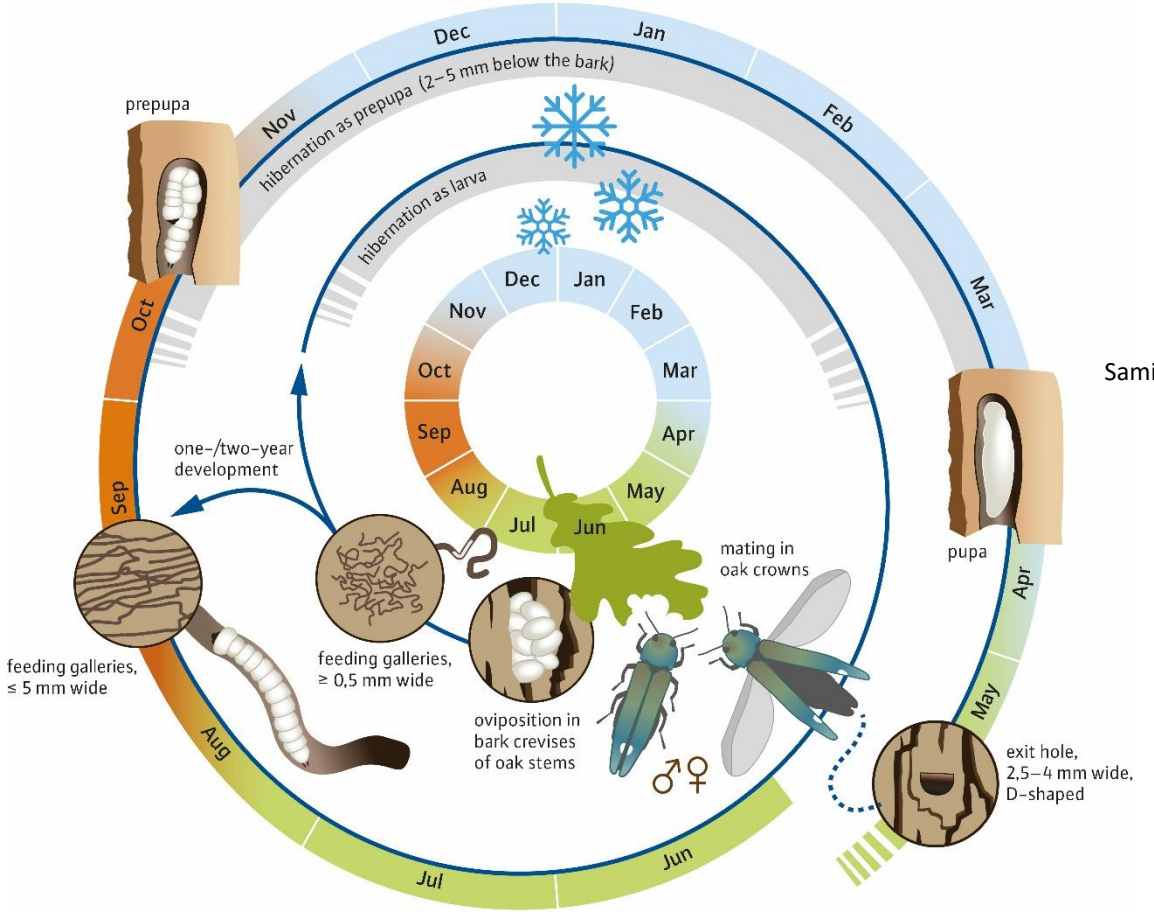
Beetle photos: S. Ulitzka (LWF)

Conclusions

- *Agrilus biguttatus* emerged from all experimental trees (1 exception) and clearly most abundant Buprestid species
- Yet species rich communities present, including Cerambycids and wood borers (indicating partially advanced decay of host tissue)
- *A. biguttatus* most abundant in lower and central stem sections and thus potentially relevant for oak decline
- Exit holes seem a poor indicator for further emergence rates

Integrated management: where do we stand?

- Challenges:
  - No unequivocal host symptoms
  - Infestation only certain when exit holes are present (1-2 years after oviposition)
- Current practice, also in other countries:
  - Preventive silvicultural measures
  - Infestation fellings
  - Both with poor quantitative evidence (Terzenbach et al. 2026)



Samira Terzenbach

Fig.: C. Hopf (LWF) from Terzenbach et al. 2026 (https://doi.org/10.1016/j.foreco.2026.123690)

Perspectives on the necessity for an integrated management of the two-spotted oak borer, *Agrilus biguttatus*, and associated research priorities

Table 1
Research priorities and associated challenges to address the relevance of *Agrilus biguttatus* for forest protection and its management.

Topic	Research questions	Challenges
Relevance: Causality of mortality	To what degree does *A. biguttatus* contribute to oak mortality? What are critical population and larval densities or affected bark areas that cause tree death?	Difficult handling of the species, unreliable identification of yet uncolonized control trees, high sample effort of long-term field experiments
Management: Prevention	(In which composition) can an understory reduce *A. biguttatus* colonization?	Inconsistent population densities, large sample size needed to account for site variability
Management: Monitoring	Does *A. biguttatus* possess pheromones?	Larger numbers of *A. biguttatus* unavailable (no mass rearing established)
	Can an efficient trap design and monitoring protocol be developed?	Inconsistent population densities
	Can larval densities be deduced from non-invasive detection methods or host symptoms?	Technological advancements require time and investment, verification of larval densities so far only possible via laborious invasive methods
Management: Population control	How effective is sanitation felling for stand protection? Does stand thinning foster *A. biguttatus* propagation? What are the ecological consequences?	Large sample size needed to account for site variability, long-term monitoring needed to record oak vigor or mortality rates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- Many fundamental questions remain
- Yet, forest practitioners require management advice
- Also not to act should be a conscious decision and has consequences

Terzenbach et al. 2026 (https://doi.org/10.1016/j.foreco.2026.123690)

Conclusions

- *A. biguttatus* probably irrelevant for oak stand vitality in majority of cases, but matters in some cases!
- What is known and can be done:
  - Preventive silvicultural measures such as understory planting (even though debated in scientific literature)
  - Sanitation felling according to decision matrix (solution in Bavaria)
  - Harvested trees must be removed (stored how far away?), debarking only an option when bark also treated/removed (insecticides would likely be effective)
- Urgent research needs:
  - Criteria to define when *A. biguttatus* populations become critical → monitoring and thresholds
  - Optimization of tree selection for sanitation felling
  - Management alternatives given frequent conflicting management targets in oak stands

Thank you for your attention!

And also many THANKS to numerous colleagues!

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