Pointer-year analysis in tree-ring chronologies of Scots pine, Norway spruce and pedunculate oak from the Lower Silesian Forests

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The study was conducted in 2025 in the Lower Silesian Forests (Bory Dolnośląskie), within the Pieńsk and Ruszów Forest Districts, as part of the Interreg Poland–Saxony 2021–2027 project. Six plots were analyzed: four Scots pine (*Pinus sylvestris*) plots, one Norway spruce (*Picea abies*) plot, and one pedunculate oak (*Quercus robur*) plot, all over 100 years old. Scots pine plots represented mixed coniferous-broadleaf forest (well drained) and coniferous forest (well drained); the spruce plot represented mixed broadleaf-coniferous upland forest (well drained); the oak plot represented mixed broadleaf-coniferous forest (well drained). A total of 123 increment cores were collected, yielding 12,754 annual rings.

Pointer years reflect synchronous tree responses to extreme climatic conditions, with most trees producing exceptionally wide or narrow rings (Wilczyński 2004). Samples were collected with a Pressler increment borer, prepared, scanned, and measured using CooRecorder. Series were synchronized in CDendro, and cross-dating was verified with Cofecha and Arstan. Raw and residual chronologies were constructed; EPS coefficients exceeded 0.85, indicating strong population signal representativeness (Koprowski et al. 2011). Pointer years were identified using a 90% tree response threshold: a year was negative if over 90% of trees showed decreased ring width, and positive if over 90% showed increased width. Interpretation involved analyzing deviations from long-term mean air temperature (t; °C) and precipitation (p; mm) for 1951–2024.

Scots pine plots showed similar growth responses, suggesting comparable site conditions and climate sensitivity. The strongest environmental stress signal was recorded in the oak plot, while the spruce plot exhibited the lowest growth variability. A pronounced negative year was 2018 for all Scots pine plots and the oak plot, associated with prolonged drought and high temperatures in Central Europe. Simultaneous responses across species, habitats, and ecological strategies indicate a strong regional climatic signal in the Lower Silesian Forests, suggesting large-scale environmental stress exceeding local site differences.

References

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