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Coppicing systems as a way of understanding patterns in forest vegetation

Radim Hédl · Jörg Ewald · Markus Bernhardt-Römermann · Keith Kirby

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A brief history of coppicing

Coppicing is a short-rotation system based on harvesting the stump regrowth of deciduous trees. In Central and Northwestern Europe, traditional coppicing was a major, and in the lowlands even the most prevalent, type of forest use from prehistory to the mid-20th century, from which time on it was largely abandoned (Hopkins and Kirby 2007; Szabó et al. 2015). In other regions, such as the Mediterranean or France, it remains an important type of forestry management to this day. Coppice systems produced a variety of products such as small poles used for fuel, larger timbers for buildings, litter for animal bedding or fodder for livestock.

The ecological consequences of traditional coppicing on forest structure and organisms inhabiting forests were profound (Buckley and Mills 2015a,b). Coppicing created a dynamic mosaic of lighter and darker phases, and in the long-run it altered soil acidity and nutrient pools (Hölscher et al. 2001; Baeten et al. 2009). Coppices thus provided a variety of habitats for a range of organisms. They had potentially strong effects on biodiversity, particularly in combination with standards (individual long-growing trees). Many species-rich forests of high conservation value were apparently coppiced in the past. After the abandonment of coppicing and deliberate transformation into high forests, forests became darker and nutrients accumulated.

Several case studies have indicated a more or less pronounced biodiversity decline caused by succession processes after the cessation of traditional coppicing management (Van Calster et al. 2007; Kopecký et al. 2013; Buckley and Mills 2015b). Restoration of coppicing systems is therefore being advocated as a means to save endangered species and communities in certain areas; elsewhere, forest management systems are being modified in attempts to create conditions similar to those

R. Hédl (✉)
Department of Vegetation Ecology, Institute of Botany, Czech Academy of Sciences, Lidická 25/27, 602 00 Brno, Czech Republic
e-mail: radim.hedl@ibot.cas.cz

R. Hédl
Department of Botany, Faculty of Science, Palacký University, Šlechtitelů 27, 783 71 Olomouc, Czech Republic

J. Ewald
Faculty of Forestry, University of Applied Sciences Weihenstephan-Triesdorf, Hans-Carl-von-Carlowitz-Platz 3, DE-85354 Freising, Germany

M. Bernhardt-Römermann
Institute of Ecology, Friedrich Schiller University Jena, Dornburger Str. 159, DE-07743 Jena, Germany

K. Kirby
Department of Plant Sciences, University of Oxford, South Parks Road, Oxford OX1 3RB, UK

of coppice woods, but in ways that fit better with modern economic conditions. However, the response of woodland systems to these attempts is not always as expected – for example, they can trigger the spread of invasive species. Therefore, our knowledge of the ecology and conservation biology of coppice systems needs to be enhanced and requires further research.

Currently, fuelwood extraction is experiencing a revival in industrialized countries as an alternative to fossil fuels. The continuation, and in a few cases even the restoration, of coppicing has been subsidized under conservation targets. At the same time, modern coppice systems growing high-yield, usually hybridogenic tree varieties are being promoted as a component of greening in the EU Common Agricultural Policy to reduce soil erosion, nitrate leaching and pesticide use on agricultural land. The critical assessment of the ecological impacts of these developments also requires a scientific basis.

Current focus on coppicing

The aim of this special issue of Folia Geobotanica is to present a selection of papers linking traditional coppicing management systems and current patterns in forest vegetation. The issue was initiated at the international conference 'Coppice forests: past, present and future' held in Brno, Czech Republic, on 9–11 April 2015. In parallel, another special issue resulting from the same conference has been prepared and published in iForest. It represents a collection of thirteen papers focusing on forestry-oriented aspects of coppicing systems (Vrška et al. 2016; http://www.sisef.it/iforest/archive/?action=collection&arg=COPCZ).

The present special issue of Folia Geobotanica contains nine original papers, reflecting the diversity of vegetation ecology research on coppices. The papers cover a range of topics from short-term understorey vegetation dynamics to interactions among coppiced tree individuals. In a review of biodiversity loss following coppice abandonment in Britain, Kirby et al. (2017) define the roles of coppicing and associated management techniques in the modern landscapes of industrialized countries. The other papers are case studies with remarkable geographic scope, ranging from the Western Mediterranean, through Central, Southern and Southeastern Europe, to Iran. Three studies address the ecology of individual species: Salomón et al. (2017) explore the physiological background of the *Quercus pyrenaica* coppices decline whereas Erfanifard and Sheikholeslami (2017) analyse intraspecific competition in Persian oak coppices. Roleček et al. (2017) define the ecological requirements of endangered plant species in a former oak coppice woodland in the Czech Republic. Volařík et al. (2017) point out the significance of multiple traditional forest uses in creating and maintaining the open canopy structure in the Romanian Banat whereas Šebesta et al. (2017) report on vegetation changes associated with conversion to high forests in the same region. Canullo et al. (2017) analyse short-term dynamics of understorey plant populations along a chronosequence in an Italian beech coppice. Finally, two papers evaluate the effectiveness of experimental coppice restoration in the Czech Republic: Šipoš et al. (2017) compared the response of functional diversity of vascular plants and spiders, and Hédl et al. (2017) found that short-term effects on vegetation were stronger under a shady lime overstorey than in oak-dominated stands.

To conclude this short editorial, we would like to suggest ideas for basic and applied research connecting coppicing systems and vegetation ecology. Several subjects have been relatively well covered by the previous research, while some directions remain to be explored further.

- *Historical effects of coppicing on vegetation*. How did coppicing alter the composition and structure of the original forests? What sorts of vegetation were most favoured when coppice systems were most active? What legacies of the coppice system persist in modern forest landscapes and how do they contribute to extant biodiversity?
- *Consequences of coppice abandonment*. How did plant communities and populations of target species react to the cessation of coppicing and conversion to high forest? Can we explore this by resurveys of old vegetation plots, using permanent plots as well as by comparing active coppices with high forest? Can more be determined from chronosequence studies (e.g. Bartha et al. 2008) to complement temporal comparisons and allow to reconstruct succession through the management cycle of coppices?
- *Benefits and drawbacks of coppice restoration*. What are the trajectories of species composition and diversity under the disturbance regime of coppicing? Can high-diversity, oligotrophic communities and populations be restored by reintroducing coppicing under modern environmental and socio-economic conditions? How are successional

pathways affected by input and release of nutrients or by invasive alien species?

References

Baeten L, Bauwens B, De Schrijver, A, De Keersmaeker L, Van Calster H, Vandekerkhove K, Roelandt B, Beeckman H, Verheyen K (2009) Herb layer changes (1954–2000) related to the conversion of coppice- with- standards forest and soil acidification. *Appl Veg Sci* 12:187–197

Bartha S, Merolli A, Campetella G, Canullo R (2008) Changes of vascular plant diversity along a chronosequence of beech coppice stands, central Apennines, Italy. *Pl Biosyst* 142: 572–583

Buckley GP, Mills J (2015a) Coppice silviculture: from the mesolithic to 21st century. In Kirby KJ, Watkins C (eds) *Europe's changing woods and forests: from wildwood to managed landscapes*. CABI, Wallingford, pp 77–92

Buckley GP, Mills J (2015b) The flora and fauna of coppice woods: winners and losers of active management or neglect. In Kirby KJ, Watkins C (eds) *Europe's changing woods and forests: from wildwood to managed landscapes*. CABI, Wallingford, pp 129–139

Canullo R, Simonetti E, Cervellini M, Chelli S, Bartha S, Wellstein C, Campetella G (2017) Unravelling mechanisms of short-term vegetation dynamics in complex coppice forest systems. *Folia Geobot* doi:10.1007/s12224-016-9264-x

Erfanifard and Sheikholeslami (2017) Competitive interactions of Persian oak coppice trees (*Quercus brantii* var. *persica*) in a pure dry woodland revealed through point pattern analysis. *Folia Geobot* doi:10.1007/s12224-017-9293-0

Hédl R, Šipoš J, Chudomelová M, Utinek D (2017) Dynamics of herbaceous vegetation during four years of experimental coppice introduction. *Folia Geobot* doi:10.1007/s12224-016-9281-9

Hölscher D, Schade E, Leuschner C (2001) Effects of coppicing in temperate deciduous forests on ecosystem nutrient pools and soil fertility. *Basic Appl Ecol* 2:155–164

Hopkins JJ, Kirby KJ (2007) Ecological change in British broadleaved woodland since 1947. *Ibis* 149(suppl. 2):29–40

Kirby KJ, Buckley GP, Mills J (2017) Biodiversity implications of coppice decline, transformations to high forest and coppice restoration in British woodland. *Folia Geobot* doi:10.1007/s12224-016-9252-1

Kopecký M, Hédl R, Szabó P (2013) Non-random extinctions dominate plant community changes in abandoned coppices. *J Appl Ecol* 50:79–87

Roleček J, Vild O, Sladký J, Řepka R (2017) Habitat requirements of endangered species in a former coppice of high conservation value. *Folia Geobot* doi:10.1007/s12224-016-9276-6

Salomón R, Rodríguez-Calcerrada J, González-Doncel I, Gil L, Valbuena-Carabaña M (2017) On the general failure of coppice conversion into high forest in Quercus pyrenaica stands: a genetic and physiological approach. *Folia Geobot* doi:10.1007/s12224-016-9257-9

Szabó P, Müllerová J, Suchánková S, Kotačka M (2015) Intensive woodland management in the Middle Ages: spatial modelling based on archival data. *J Hist Geogr* 48:1–10

Šebesta J, Maděra P, Řepka R, Matula R (2017) Comparison of vascular plant diversity and species composition of coppice and high beech forest in the Banat region, Romania. *Folia Geobot* doi:10.1007/s12224-016-9279-3

Šipoš J, Hédl R, Hula V, Chudomelová M, Košulič O, Niedobová J, Riedl V (2017) Patterns of functional diversity of two trophic groups after canopy thinning in an abandoned coppice. *Folia Geobot* doi;10.1007/s12224-017-9282-3

Van Calster H, Baeten L, Schrijver A, Keersmaeker L, Rogister LE, Verheyen K, Hermy M (2007) Management driven changes (1967–2005) in soil acidity and the understorey plant community following conversion of a coppice-with-standards forest. *Forest Ecol Managem* 241:258–271

Volařík D, Svátek M, Šenfeldr M, Kučera A, Šrámek M, Dreslerová J, Matula R (2017) Variation in canopy openness among main structural types of woody vegetation in a traditionally managed landscape. *Folia Geobot* doi:10.1007/s12224-016-9280-x

Vrška T, Motta R, Mosseler A (eds) (2016) Is there a place for coppicing as a silvicultural system in the 21th century? *iForest*, on-line material. Available at http://www.sisef.it/iforest/pdf/COPCZ_introduction.pdf