

## CONSERVATION PERSPECTIVES FOR CENTRAL EUROPEAN LICHEN SCOTS PINE FORESTS IN POLAND

Zbigniew Kołodziej<sup>1</sup>✉, Piotr Bilański<sup>2</sup>, Marek Pająk<sup>3</sup>

<sup>1</sup>Institute of Silviculture and Forest Ecology, Department of Silviculture, University of Agriculture in Krakow  
29 Listopada 46, 31-425 Kraków, Poland

<sup>2</sup>Institute of Protection of Forest Ecosystems, Department of Forest Protection, Forest Entomology and Climatology,  
University of Agriculture in Krakow, 29 Listopada 46, 31-425 Kraków, Poland

<sup>3</sup>Institute of Silviculture and Forest Ecology, Department of Forest Ecology and Reclamation, University of Agriculture in Krakow  
29 Listopada 46, 31-425 Kraków, Poland

### ABSTRACT

The article describes 91T0 habitat resources in the Natura 2000 network. It is noted that Poland has a special responsibility for the maintenance of the habitat on the European continent, by virtue of its participation in Polish Natura 2000 sites and Poland's request that it be added to Annex I of the Habitat Directive. It has been shown that the information about lichen Scots pine forest resources and their present condition in many Polish Natura 2000 sites need to be verified and updated. The authors conclude that the proposed methods for the maintenance of existing patches of habitat 91T0 at a favourable conservation status are too conservative and do not guarantee achievement of the conservation objectives. This paper proposes the removal of litter and humus or optionally controlled surface fires, as a method of ensuring a stable presence of lichen forests in the Polish landscape. The rationale for this approach is the accumulated knowledge in the field of development of the lichen forests in Poland and its role in ecological succession.

**Key words:** lichen forests, Natura 2000 network, active protection

### INTRODUCTION

The Scots pine lichen forest (91T0) appeared in Annex I of the Habitat Directive (HD) along with the Holy Cross fir forests (*Abietetum polonicum*) (91P0) and the Western Carpathian calcicolous *Pinus sylvestris* forests (91Q0) at Poland's proposal, submitted during accession negotiations. It should be noted that, during negotiations, 19 proposals were submitted, of which the previously mentioned proposals obtained full acceptance and were given the status of independent natural habitat types. Nine other proposals were accepted via broadening of habitat type definitions already listed in Annex I of the HD, while the remaining seven were rejected because of the

legal ramifications their acceptance would have in the Member State of the European Union (the need to supplement their national Natura 2000 networks with sites protecting the proposed habitats, e.g. Classa *Alnetea glutinosae*) (Herbich, 2004; Mróz and Perzanowska, 2001).

A natural consequence of supplementing the list of natural habitat types in Annex I of the HD with habitats reported by a given country is the acceptance, by that country, of a leading role in adding to the Natura 2000 network those sites, in which these habitats will be adequately represented and maintained in the proper state of protection.

✉ rkolodz@cyf-kr.edu.pl

## LICHEN FORESTS IN THE NATURA 2000 NETWORK

In the first stage of accession negotiations, lichen forests were not accounted for in Annex I of the HD (Mróz and Perzanowska, 2001). They appeared only afterwards, following Germany's acceptance of the proposal. The legal effect of this acceptance was that Germany now had to account for the 91T0 natural habitat in Natura 2000 network sites located in the country, part of which is covered by the scope of this habitat. As a result, according to the European Environment Agency (EEA, 2015), lichen forests were distinguished in 11 already existing Natura 2000 sites in Germany on a combined total area of 2201.40 ha. No need for the creation of new sites was determined.

Among those countries that joined the European Union together with Poland in 2004, the presence of the 91T0 habitat was only demonstrated in the Natura 2000 sites of the Czech Republic and Lithuania. In Lithuania, the occurrence of lichen forests was demonstrated in three sites with a total area of 463.78 ha, while in the Czech Republic it was demonstrated on a total area of 430.37 ha in two sites (EEA, 2015). According to the same source, in Poland, the 91T0 natural habitat was noted in the Standard Data Forms of 57 sites, which put the combined total area of lichen forests at 6497.15 ha. The data require that Poland maintain a favourable conservation status for almost 68% of the area of the 91T0 habitat included in the Community's Natura 2000 network.

## LICHEN FORESTS IN POLAND

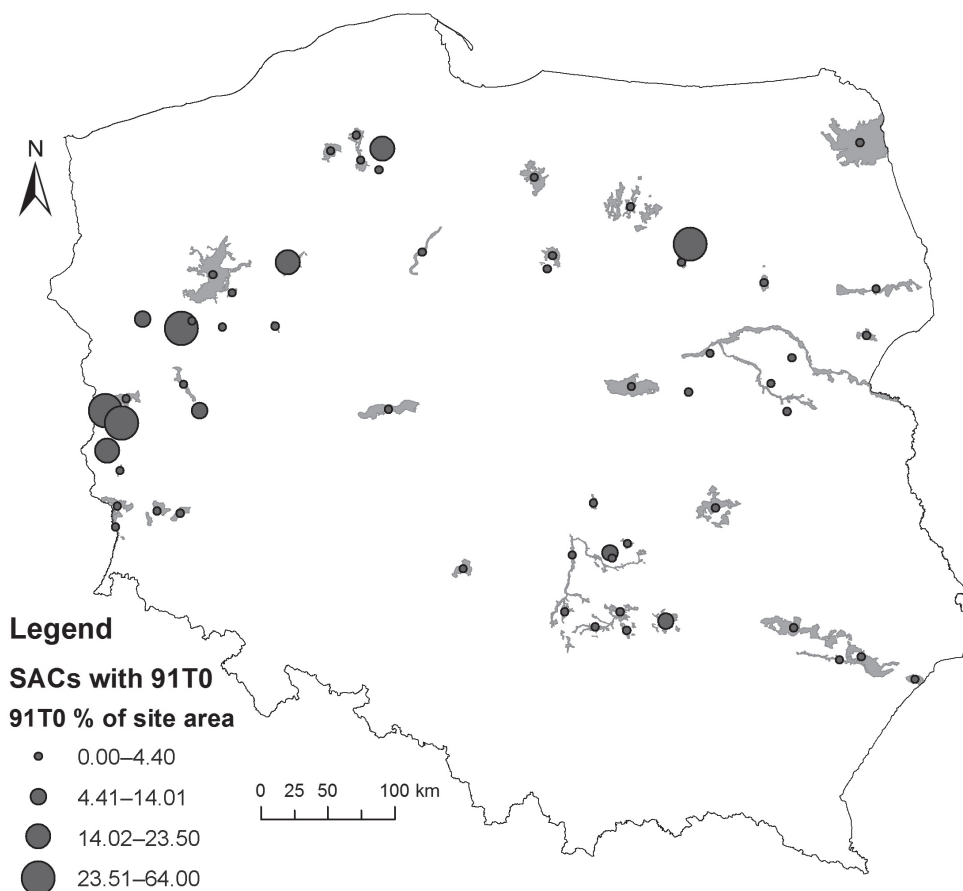
Up until the middle of the 20th century, the Scots pine lichen forest was a relatively common type of phytocoenosis in Polish forests, while at the turn of the 21st century, it was estimated to make up around 9% of the total area of all Scots pine forests, or about 50,000 ha (Matuszkiewicz, 2002). In light of current scientific studies this appears to be highly overestimated, with trends indicating a dynamic recession of lichen inland forests in Poland's landscape.

In the past, human activity associated with the intensive use of forests growing on even the poorest soils helped in the spread and persistence of lichen forests. The removal of litter and decayed wood, as

well as the gathering of wood limited the fertility of the upper layers of soil. This in turn created favourable conditions for the growth of lichens at the expense of herbaceous plants and shrubs typical of fresh forests. With the abandonment of forest litter removal (such practices were a rarity in Poland by the 1980s), factors slowing the growth of herbaceous plants and shrubs were eliminated. If one also takes into account the fertilization of forest stands associated with the deposition of nutrients released into the atmosphere by industry, mass communication, and agriculture, then the speed of the recession of lichen forests should come as no surprise.

Despite the clearly anthropogenic determinants of the spread of lichen forests in Poland, they are still, and rightfully so, regarded as a potential type of natural vegetation. However, in this regard, the number of lichen forests in Poland associated with extremely poor and dry habitats is small and they occupy only small areas. For example, in the Tuchola Forest, where the best-preserved fragments of lichen forest can be found (Węgrzyn and Masłowska, 2010) and where mapping determined lichen forests to make up 20% of the Bory Tucholskie National Park (Matuszkiewicz, 2007), the area of potential natural vegetation corresponding to the 91T0 habitat makes up barely 0.5% (Matuszkiewicz and Solon, 2006). According to other authors, lichen forests make up 0.15% of this national park's area (4,613 ha) (Danielewicz and Pawlaczyk, 2004).

As noted above, inland lichen forests appear in 57 special areas of conservation (SACs) in Poland (Fig. 1), for a combined total area of 6497.15 ha, which makes up 68% of the total area of the 91T0 habitat included in the European Natura 2000 network (EEA, 2015). Unfortunately, an analysis of the data contained within the SDF and a comparison with other sources seem to indicate a number of often glaring discrepancies. For example, the area of the 91T0 habitat (1446.82 ha) in the Bory Chrobotkowe Puszczy Noteckiej SAC (PLH080032) does not seem very credible when related to the records contained in the „Habitat and species protection guide Natura 2000 – A methodical handbook” (Danielewicz and Pawlaczyk, 2004). Also unsettling is the fact that 5701.92 ha (approx. 88%) of the 91T0 habitat is grouped into only 12 sites, of which only one was involved in a partial natural habitat monitoring – the Nature Reserve Bór Chrobotkowy



**Fig. 1.** Distribution and percentage contribution of Central European lichen Scots pine forests in special areas of conservation (SACs) in Poland

**Rys. 1.** Perspektywy zachowania śródlądowych borów chrobotkowych w Polsce

with an area of 41.5 ha which is part of the Młosino–Lubnia SAC (PLH220077) with an area of 2469.50 ha, of which 20.92% (516.62 ha) qualified as a 91T0 habitat (EEA, 2015; Węgrzyn and Masłowska, 2010). It is interesting to note that in the neighboring Jeziora Wdzydzkie SAC (PLH220034) and Sandr Brdy (PLH220026), which are also involved in natural habitat monitoring, the area of 91T0 equates to 0.0 and 28.47 ha respectively, according to the SDF.

It is beyond any doubt that the data describing the 91T0 habitat in Poland’s Natura 2000 network sites require urgent verifying and updating, while the network of monitoring sites needs to be extended to include sites in which the habitat’s surface area is significant ( $\geq 100$  ha or  $\geq 5\%$  of the site’s surface area).

#### PROPOSED MEASURES TO ENSURE AN APPROPRIATE DEGREE OF PROTECTION

In a methodical handbook concerning the monitoring of natural habitats, it has been proposed that all wood left over from silvicultural treatments be removed from preserved fragments of lichen forests (Węgrzyn and Masłowska, 2010). In our opinion, these recommendations are not able to stop the disappearance of inland lichen forests and they call for the urgent actualization of more radical protective measures.

Well-known examples indicate that some factors contributing highly to the formation of the 91T0 habitat include surface fires as well as the removal of litter and decayed wood (Faliński, 1965; Heinken

et al., 2009; Matuszkiewicz, 2007). It is time to design projects in nature reserves and Natura 2000 sites if we want to maintain or restore larger patches of the habitat in forest stands of medium and older age class. Limiting protective measures to the thinning of stands or to the removal of harvested wood mostly really affects younger stands in which the formation of lichen forests is most often a periodic occurrence resulting from earlier disruptions, such as logging, or the renewal or afforestation of poor farmland. These measures undoubtedly speed up the formation of lichen forests in younger stands. However, according to the authors, they are unable to halt the secondary targeted succession that results in the transition of lichen forests into fresh coniferous forests in older stands. In older stands, only the radical depletion of the nutrient-rich top layers of soil is able to slow the displacement of lichens by grasses and shrubs. Measures that rely only on the removal of wood, while allowing for the contemporary deposit of nutrients that cause eutrophication in forest habitats or allowing for their circulation throughout forest ecosystems, are not radical measures.

## REFERENCES

- Danielewicz, W., Pawlaczyk, P. (2004). Lasy i bory [Broadleaf and coniferous forests]. In J. Herbich (Ed.), *Poradniki ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny* (pp. 289–296). Vol. 5. Warszawa: Ministerstwo Środowiska [in Polish].
- EEA (2015). European Environment Agency. Natura 2000 data – the European network of protected sites. Retrieved February 3, 2015, from <http://www.eea.europa.eu/data-and-maps/data/natura-1/>
- Faliński, J. B. (1965). O roślinności Zielonej Puszczy Kurpiowskiej na tle stosunków geobotanicznych tzw. Działu Północnego [The vegetation of the Green Kurpiowska Forest against the geobotanical relations of the so-called North Division]. *Acta Soc. Bot. Pol.*, 34(4), 719–752 [in Polish].
- Heinken, T., Fischer, P., Günzl, B., Kelm, H.-J., Meyer, P., Prüter, J., ..., Waesch, G. (2009). Restoration of Central European lichen pine forests by removal of litter and humus. In: *Book of abstracts, 2<sup>nd</sup> European Congress for Conservation Biology*. Czech University of Life Sciences, Prague, September 1–5.2009.
- Herbich J. (Ed.). (2004). *Lasy i bory. Poradniki ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny [Broadleaf and coniferous forests. A guide to the conservation of Natura 2000 habitats and species – A methodical handbook]*. Vol. 5. Warszawa: Ministerstwo Środowiska [in Polish].
- Matuszkiewicz, J. M. (2002). *Zespoły leśne Polski [Poland's forest complexes]*. Warszawa: Wyd. Nauk. PWN [in Polish].
- Matuszkiewicz, J. M. (Ed.) (2007). *Geobotaniczne rozpoznanie tendencji rozwojowych zbiorowisk leśnych w wybranych regionach Polski [Geobotanical recognition of developmental tendencies of forest communities in selected regions of Poland]*. Monografie 8. Warszawa: IGiPZ PAN [in Polish].
- Matuszkiewicz, W., Matuszkiewicz, J. (1973). *Przegląd fitosocjologiczny zbiorowisk leśnych Polski. Cz. 2. Bory sosnowe [A phytosociological overview of Poland's forest communities. Part 2. Pine woods]*. *Phytoceonosis*, 2(4), 273–365 [in Polish].
- Matuszkiewicz, J. M., Solon, J. (2006). Forecasting of states of ecosystems in protected areas on the basis of a comprehensive digital vegetation map (as exemplified by Poland's Bory Tucholskie National Park). *Geogr. Pol.*, 79(1), 65–94 [in Polish].
- Mróz, W., Perzanowska, J. (2001). *Dyrektywa Siedliskowa: siedliska przyrodnicze o znaczeniu europejskim w Polsce [Habitat Directive: Natural habitats of European importance in Poland]*. *Chrońmy Przyr. Ojcz.*, 57(5), 55–73 [in Polish].
- Węgrzyn, M., Masłowska, M. (2010). 91T0 Śródładowy bór chrobotkowy [91T0 Inland Lichen Forest]. In W. Mróz (Ed.), *Monitoring siedlisk przyrodniczych. Przewodnik metodyczny. Cz. 1* (pp. 295–311) Warszawa: GIOŚ, [in Polish].

## PERSPEKTYWY ZACHOWANIA ŚRÓDLĄDOWYCH BORÓW CHROBOTKOWYCH W POLSCE

### ABSTRAKT

W artykule omówiono zasoby siedliska 91T0 w sieci Natura 2000. Zwrócono uwagę, że nasz kraj ponosi szczególną odpowiedzialność za zachowanie tego siedliska na kontynencie europejskim ze względu na jego przynależenie do polskich obszarów Natura 2000 oraz wnioskowanie, by znalazło się w I załączniku DS. Wykazano, że informacje o zasobach i stanie borów chrobotkowych w wielu polskich obszarach sieci Natura 2000 wymagają weryfikacji i uaktualnienia. Zdaniem autorów także proponowane metody utrzymania płatów siedliska 91T0 we właściwym stanie ochrony są zbyt zachowawcze i nie gwarantują osiągnięcia założonego celu. W artykule zaproponowano wygrabianie ścióły i butwiny oraz ewentualnie kontrolowane pożary powierzchniowe jako metody zapewnienia trwałej obecności borów chrobotkowych w krajobrazie Polski. Uzasadnieniem takiego postępowania jest zgromadzona wiedza na temat kształtowania się borów chrobotkowych w Polsce i ich miejscu w szeregu ekologicznym borów (Faliński, 1965; Matuszkiewicz, 2007; Matuszkiewicz i Matuszkiewicz, 1973).

**Słowa kluczowe:** bory chrobotkowe, sieć Natura 2000, ochrona czynna