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PROTECTION OF SEGETAL FLORA AND VEGETATION IN POLAND (HISTORICAL OUTLINE)

ABSTRACT

The flora associated with crop land maintained a stable species composition for many centuries until the 1960s when profound and fast changes occurred due to human activity. Factors that destructively affect given species, but also whole field communities, are: continuous chemicalization of agriculture (i.e. application of crop protection substances, pesticides, and mainly herbicides, as well as spreading of high doses of mineral fertilizers on crop land), introduction of sowing material that is completely purified from weed seeds, introduction of new races of crop plants, simplification of crop rotation patterns, introduction of new techniques of soil and plant cultivation and draining of cultivated fields. These factors have caused various transformations of the field flora, often abruptly and chaotically, such as the disappearance of numerous weed species. The rate of these transformations varies from country to country, region to region, and even field to field. These facts have made numerous investigators pay much interest to the conservation of the segetal flora, both in cultivated land and in preserved areas, such as national and landscape parks, botanical gardens and open-air museums. The problem of transformations in the segetal flora vegetation is a very important one both from the utilitarian and 'nature conservation' point of view.

Key words: flora, historical outline, Poland, protection, vegetation

INTRODUCTION

Segetal flora and vegetation, having formed and accompanied cultivated crops for many centuries, have shown significant stability and a more or less constant species composition until recently.

These artificial, short-lived ecosystems started to undergo exceedingly rapid and deep transformations in the 1960s, due to multifactorial human activity. The causes which had a destructive influence on individual species as well as arable

field communities were the following: especially extensive introduction of chemicals into agriculture, application of pesticides for crop protection, but even more so application of herbicides and high doses of mineral fertilisers and liming of soil. Moreover thorough cleaning of crop seed material of weed diaspores, introduction of new varieties of agricultural crop species, machine harvesting of crops, simplified crop rotation, application of novel agricultural technologies, soil drainage, overall industrialisation etc. (Herbich 1986; Kornaś 1961, 1972; Kuźniewski 1983; Nowiński 1948; Siciński 1982, 1986, 1987, 1988, 1994; Sokołowski 1988). These factors often act cumulatively and work in a complex detrimental manner.

Due to radical transformations in agricultural practices numerous segetal species became threatened. Some of them, hitherto characterised by common occurrence, like common corncockle *Agrostemma githago*, rye brome *Bromus secalinus* or wild mustard *Sinapis arvensis*, began to disappear almost entirely in some areas. At the same time, new weed species started to appear in arable fields. These qualitative and quantitative changes happening in the fields have been noticed and recorded already in the 1960s and 1970s by many researchers studying segetal flora and communities (Kornaś 1961, 1972; Mirek 1976; Siciński i in. 1978).

An even more dire fate befell the so-called “flax specialists”, linked closely to flax cultivation (Kornaś 1961).

As a result of exogenous factors, transformations of field flora and vegetation have already occurred and are still occurring, rapidly, often catastrophically and chaotically. Many species of weeds disappeared from our fields, including those most vulnerable and at the same time most faithful and ancient companions of cultivated crops, while their place was taken often by expansive species.

The rate of these transformations is different in various countries, various regions, and sometimes even on adjoining fields.

HISTORY

The listed facts engendered interest among Polish researchers for problems of protection of segetal flora and communities. Information on the disappearance of many vulnerable species and impoverishment of field communities has been forthcoming at that time from some countries of Western Europe (Germany, the Netherlands, Denmark, France etc.).

Even much earlier than that, some of our scientists have pointed out the need for protection of arable field weeds due to their significance and availability for usage as cheapest cover plants for the recommended “green fallows” as opposed to “black fallows” (Paczoski) quoted in Nowiński (1948). The advantageous impact of some weeds on cultivated crops during cultivation, as well as their ability to draw out the so-called microelements from deeper soil layers, were pointed

out by Nowiński (1948). The usefulness of the characteristics and properties of some weeds in gardening, agriculture and forest management was described by Jelonek (1948).

The presence of specialised weeds in flax crops, displaying phenotypic convergence with flax plants, turned these phytocoenosis components into extraordinarily dangerous nuisances. However, direct means taken to combat this threat led to their rapid decline. The flax spurrey – remote ryegrass association (*Spergulo-Lolietum remoti*) ceased to exist in the Gorce mountains (Kornaś 1961) and later also in other parts of Poland.

The rapid changes in synanthropic vegetation occasioned by industrialisation and the technological revolution in agriculture were noticed and described by Kornaś (1972). Under the influence of transformed agrotechnology, including the newly applied herbicides, arable fields saw an extraordinarily rapid disappearance of ancient companions of cultivated crops, such as: *Agrostemma githago*, *Adonis flammea*, *A. aestivalis*, *Bupleurum rotundifolium*, *Caucalis platycarpos*, *Papaver rhoeas*, *Ranunculus arvensis* and others. Their place was often taken by other species, usually expansive ones and stronger competitors for the crop plants themselves, such as: *Apera spica-venti*, *Avena fatua* etc. The colour landscape of fields undergoes significant changes due to impoverishment and decline of former associations, with emergence of new ones with changed floristic composition.

First publications concerning suggestions on conservation practices for field weeds appear in Poland in the 1980s.

Kuźniewski (1983) in his work cites published data from the German Democratic Republic, specifically from the two districts of Halle and Magdeburg, where more than 45% of all threatened plant species in this area were weeds linked with agricultural crops. He came to the conclusion that modern agrotechnical practices pose a danger to the existence of some taxa in our country as well. Furthermore, he describes at length the causes and results of disappearance of specific species. Taking into account the tendencies of emerging transformations, he suggests to create small plots set aside for extensive agricultural management. This would lead to emergence of small agricultural reserves with a nature monument status. He points out the advantages of these type of sites as objects for agroecological studies. In some countries of Western Europe similar solutions gave positive results leading to the restitution of weed species previously extinct in the fields. The aim of these actions would be to preserve for future generations the entire richness of our nature.

The serious consequences such as impoverishment of genetic resources of the national, regional and local flora, disappearance of typical and characteristic communities and decline of positive influence of weeds on cultivated crops, were all pointed out by Herbich (1986). He suggested effective protection for segetal weeds on dedicated experimental field plots, e.g. managed by agricultural

universities or Provincial Centres of Agricultural Progress, but also within open-air village museums where extensive agriculture can be restored. Further he lists a number of conditions that have to be taken into account when acting on his suggestions (extensive farming, traditional crops, seed material etc.).

Taking into account the fact that arable ground occupies ca. 50% of the area of Poland, with some regions having even higher coefficients of agricultural land use, e.g. Porycze Land, Kujawy, Błonie Land, Łowicz Land, Sandomierz Land, Hrubieszów Land and others, they fulfil a very important role not only from the economical point of view, but also with regard to protection of nature and the environment, as described by Siciński (1986, 1987). These facts are of extraordinary importance since the transformations in agrocoenoses occur at an exceptionally rapid pace, occasioned by a complex mix of factors. The areas which are most valuable from the naturalist point of view, such as national parks, nature reserves or landscape parks, generate the conditions for creating aggroreserves within their borders or in the direct vicinity. These reserves could also be formed on field plots within open-air museums, botanical gardens, fields belonging to Provincial Centres of Agricultural Improvement etc.

The same author insists that aggroreserves could be a form of harmonious union of nature protection with sustainable economical management of protected agricultural areas (Siciński 1986, 1987).

According to Sokołowski (1988), segetal species play a significant role in the functioning of agrosystems. Segetal communities that are in the process of losing their floristic diagnostic characteristics may be observed in many European countries, including Poland. The author suggests various forms of protection for species of weeds from our arable fields as well as old culture crops.

The Polish legislation on nature protection does not provide any protection to synanthropic plants. This problem should be taken into account in new versions of relevant laws.

The listing of rare and threatened species of Polish flora published by Jasiewicz (1981) does not contain any threatened species of segetal plants.

The list of endangered and threatened plants in Poland (Zarzycki, Wojewoda 1986) also makes no mention of species linked to agricultural crops.

The Polish Red Data Book of Plants (Zarzycki, Kaźmierczakowa 1993) lists only a single segetal species, the fiery pheasant's-eye (*Adonis flammea*) from the *Ranunculaceae* (buttercup) family, a very rare weed, occurring sparsely on limestone soil in Southern Poland, with a threat category of E (endangered) according to International Union for Conservation of Nature (IUCN) criteria.

An attempt to determine the causes and level (status) of threat as well as conditions and possibilities of preservation of the segetal flora in Central Poland was made by Warcholińska (1986-1987). The list of rare and threatened weed species included 96 representatives with varying status (threat category).

The subsequent listing prepared by Warcholińska (1994) for the same group

of plants, but for the whole territory of Poland, includes 100 taxa [Ex – extinct and probably extinct species (4), E – endangered species (11), V – vulnerable species (34), R – rare species (26) and I – species with indeterminate threat level (25)]. Taking into account the fact that Polish segetal flora numbers more than 400 species (Mowszowicz 1975), it means that recession has affected a fourth part of it, or 25%.

The 20th National Scientific Conference on “Regionality of segetal weeds in Poland” was organised in Łódź on June 20th-21st, 1996, with “Endangered and threatened species of the segetal flora” as its topic. The conference was organised by scientists from the Department of Botany, Institute of Ecology and Environmental Protection, University of Łódź and Department of Weed Eradication and Ecology of the Institute of Agriculture, Fertilisation and Soil Science in Wrocław.

This important conference highlighted the status as well as causes and level of threat to the species diversity of segetal flora in individual regions of Poland. Some actions were proposed to place endangered and threatened taxa under protection.

The rich scientific output of the 20th National Scientific Conference was included in a book publication from the University of Lodz Press in 1998 – *Acta Universitatis Lodzensis, Folia botanica* 13 – Endangered and threatened species of segetal flora (Adamczewska, Janowska 1998; Anioł-Kwiatkowska 1998; Bomanowska 1998; Buliński 1998; Chmiel 1998; Ciosek, Skrzyczyńska 1998; Fijałkowski, Nycz 1998; Hochół 1998; Jędruszczak 1998; Kapeluszy 1998; Korczyński 1998; Korniak 1998; Korniak, Kuszewska, Błocki 1998; Krzemińska –Freda 1998; Kutyna, Leśnik 1998; Kuźniewski 1998; Latowski 1998; Łabza 1998; Pawlak 1998; Skrzyczyńska, Rzymowska 1998; Skrzyczyńska, Skrajna 1998; Siciński 1998 a, b; Sobisz 1998; Stupnicka-Rodzinkiewicz, Łabza, Hochół 1998; Szmeja 1998; Trąba, Ziemińska 1998; Urbisz, Urbisz, Nowak 1998; Warcholińska 1998; Warcholińska, Gmerek 1998; Wnuk 1998; Wnuk, Piasek 1998).

CONCLUDING REMARKS

The world strategy of nature protection (Olaczek 1985) as well as the Strategy for protection of living nature resources in Poland (Ryszkowski, Bałazy 1991) stipulate the development of rural economy based on protection of resources and habitats of threatened and rare species as well as unique ecosystems.

The UN Conference on Environment and Development took place in Rio de Janeiro on June 3rd-14th, 1992. The Polish delegation signed on behalf of our country the “Convention on Biological Diversity”, thus undertaking the obligation of taking action for preservation of Polish nature. The convention prescribes protection of biodiversity in protected areas, but also outside of them, in fores-

ted, agricultural and settled areas (Kozłowski 1993; Wajda, Żurek, unpublished data).

It is a paradox of sorts that agrophytocoenoses which appeared and persisted due to systematic farming practices, nowadays belong to the ones most endangered specifically due to farming activities.

Decrease in the number of localities and population strength for a large group of arable field plants leads to quantitative and qualitative changes and at the same time to the decrease of biological diversity of species and to the decline of individual segetal associations (biocoenotic diversity).

Thus, there is an urgent need for protection of endangered components of our fields which bestow a characteristic and interesting colour scheme on these fields in several regions of the country, being a significant natural element of the cultural landscape.

Impoverishment of segetal flora and vegetation is a very important problem from the practical and scientific point of view.

There is, therefore, no exaggeration in the statement that preservation of species and ecological diversity is a problem both for the current generation and for subsequent ones. It is important for us to take care of this difficult and important topic in a timely manner, before these colourful communities become only a part of history in our country.

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