BIOGEOGRAPHICAL DIVISION OF THE CZECH REPUBLIC

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Abstract

Presented biogeographical division of the Czech Republic was done first of all for purposes of national and regional ecological networks. This division has its own hierarchy, consisting both of and typological biogeographical unites. Higher unites (province, subprovince, bioergion) are of individual character, lower unites (biochora, group of geobiocoene types) are of typological charakter. Some of the unites are similar to that of EECONET. All the biogeographical unites are described now and with exception of the group of geobiocoene types are published with maps in the scale 1:50 000.

Key words: Biogeographical division, Czech Republic, ecological networks, biogeographical province, subprovince, region, biochora, group of geobiocoene types

1. Introduction

Nature protection especially in the last decades of the 20th century was led by the biodiversity protection concept. This direction resulted in proposals of the Territorial Systems of Ecological Stability of the Landscape in the former Czechoslowakia (Lőw 1978, 1983, Buček, Lacina 1984, Buček, Lacina, Míchal 1996) and of Ecological Networks in the Netherlands (Collective 1990) and in the EU (Jongman 1996, Bennet 1999). Both these networks must be based on the biogeographical division of the respective territory.

Biogeographical division of a territory is considered to be an important part of scientific development and often has impact on the practise too (Buček, Lacina 1979). The presented biogeographical division of the Czech Republic was eleborated first of all for the purposes of the Territorial Systems of Ecological Stability of the Landscape, i.e. National Ecological Network (NECONET). The aim of the NECONET is to make possible a non-degenerative persistance and further development of the populations of the natural and semi-natural biocoenoses. For this aim the preservation of these biocoenoses and their ecotops, is necessary. To know all types of biocenoses and ecotops a detailed biogeographical division must be done. This division should have its global, regional, choric and elementar level.

Presented division of the Czech Republic is based on potential biota and its ecotopes, it takes the chorological aspect in consideration too, i.e. the spread of various geoelements of biota. During the elaboration need of international cooperation was felt, especially in the districts along the state border.

2. Territorial units used for ecological network in the Czech Republic

Hierarchical levels of the biogeographical units in the CR:

1. biogeographical province
2. biogeographical subprovince
3. biogeographical region (bioregion)
4. biochora
5. group of the geobiocoene types

Biogeographical provinces, subprovinces and bioregions are induvidual units, biochoras and groups of geobiocoene types are typological units.

2. Explanation of the Biogeographical unites used in the Czech Republic

Biogeographical province is an individual biogeographical unit. Its territory has its own sequence of altitudinal vegetation tiers. From surrounding provincies it differs in decesive geoelements. In the scope of the biogeographical province specific geological and geomorphological structure are visible. The area of biogeographical province is usually bigger than 5.10^5 km^2.

Biogeographical subprovince is an individual biogeographical unit. Its biota has typical diversity, combination of the geoelements and has it's own endemic species. Its territory has its specific modification of altitudinal vegetation tiers, from surrounding subprovincies it differs in edificators of one or more vegetation tiers. In the scope of the biogeographical subprovince usually specific geological and geomorphological structure are visible. The area of biogeographical subprovince is typically more than 10^5 km^2.

Biogeographical region (bioregion) in the Czech Republic

The bioregion is an individual, unique unit of the biogeographical division on the regional level (in geographic sense). From the typological point of view the bioregion is mostly heterogenous on the elementar and mostly on the regional level too. A bioregion consists of a characteristic mosaic of groups of geobiocene types (Zlatník 1975) and typical combination of biochoras. The biocenoses of a bioregion are under influence of bioregion's possition and have characteristic chorological features; these are the result of a specific postglacial development. In the scope of a bioregion other differences in composition of potential biota shouldn't exist, than differences caused by a different ecotope. The bioregion is mostly characterised also by a specific type and a certain intensity of the antropogenic influence, i.e. also by specific present-day biocenoses. Bioregion is to be of an area of 100 – 5000 km^2.

Biochora (Culek 1985, 1989) is a higher typological unit in the scope of bioregion. It is more or less heterogenous. It is based on a typical presence, distribution ans contrast of elementar units - groups of geobiocoene types (Zlatník 1975). This quality is expresed by the combination of the altitudinal vegetation tier, type of the georelief and the soil substratum. Biochoras are delimited on the base of primeval landscape structure, potential biota, but ussually have their type of landuse too. Area of one segment of biochora is 0,3 – 300 km^2.

Group of geobiocoene types (Zlatník 1956, 1975, 1976) is lower typological unit. It is the elementar unit for purposes of NECONET in the Czech Republic. The type of geobiocoene is the set of natural geobiocoenose and of all of it antropogenically changed geobiocoenoses. Within the group of geobiocoene types single geobiocoene types with similar persistant ecological conditions are included. Groups of geobiocoene types are the scope of so similar ecological conditions (climatical and soil), that they have their own composition of biota, space structure of biocenose, produktivity and dynamism. The area of one segment of geobiocoene type group is about $10^{-2} – 10^1$ km^2.

4. Method and the resultes

4.1. Biogeographical provinces

Biogeographical provinces were elaborated on the base of the Udvardy's division (Udvardy 1975). It is in good correlation with Biogeographical Regions (Bennett 1999) used now in EU for the NATURA 2000 Programme. These Regions mostly fullfils demands on biogeographical provinces. According to this division the prevailing part of the Czech territory belongs to the Biogeographical province of the Middle-European deciduous forests, only a part of Southern Moravia belongs to the Pannonian province with the area 3.265 km^2, i.e. 4,1 % of the Czech Republic. It was distinguished mainly on the base of new recognised phytocoenological taxon of thermophilous oak forests on loess plains (*Aceri Tatarovi-Quercion*) in Czech Republic (Chytrý 1997). Our delimitation of the Pannonian province was accepted in NATURA programme too.

4.2. Biogeographical subprovinces

Biogeographical subprovinces are important for proposals of ecological networks in large territory (Bínová, Culek, Kopecká, Míchal, Plesník 1995). We decided to use the division of European flora done by Meusel (1965) as the starting point, as according to our experience Meusel's subprovinces of the Central Europe meet the demands on biogeograpical subprovinces. Usefull proposal of phytogeographic subprovinces (Hendrych 1984) was also taken in account. In our territory biogeographical subprovinces were detailized, the last version is published by Culek et al. (Culek 2005). According to this, the Middle-European deciduous forests province in our territory is divided into three subprovinces. The Hercynian subprovince is the largest one, it is situated in the western part of the Republic. The total area of Hercynian subprovince is 66.805 km^2, i.e. 84,7 % of the state area. Small area in northeast, mostly in Silesian lowlands, belongs to the Polonian subprovince with the area 1.696 km^2, i.e. 2,2 % of the Czech Republic. In the southeastern part of the Republic the Westcarpathian subprovince is to be found with area of 7.104 km^2, i.e. 9,0 % of the state. Small area of the Pannonian province in the lowlands and hilly lands of south Moravia belongs to the North-Pannonian subprovince (3.265 km^2, i.e. 4,1 %).

Relatively detailed characteristics of respective subprovinces were elaborated in good cooperation with a team of botanists and zoologists of the Brno Universities. Results are published in Biogeographical division of the Czech Republic (Culek 1996).

4.3. Biogeographical regions (bioregions)

Bioregions are important for projects of national ecological network. Criteria for the proposal and the delineation of a bioregion are as follows. Criteria are ordered according to their importance:

1. The area is larger than 100 km^2, its width above 2,5 km. The smaller the territory is, the greater should be the differences in nature from the surrounding landscape.
2. The space connectivity of the territory. The bioregion also shouldn't be formed by almost separated parts connected only by a narrow corridor.
3. The relative homogenity in spreading of geoelements and migrants.
4. "The recurrent pattern" - a recurrent of ecotops, typical combinations and catenas.
5. The catchment area of the same sea (with exception of mountain regions).

While elaborating the bioregions the older geobotanical (Mikyška 1968-1972) and biogeographical maps (Raušer, Zlatník 1966) were compared and if possibly corrected

according to climatical, geological, geomorphological and pedological maps. Interesting was unusual division of the Czech landscape (Hynek, Trnka, Herber 1984). Great help in relativelly new Regional phytogeographic division of the Czech Republic (Skalický 1988) was found. New map of Natural potential vegetation (Neühauslová 1998) in the revision of bioregions was taken in consideration. The spread of botanic geoelements, such as perialpine, alpine, carpathian, subatlantic, pontic and pannonic, submediteranean, boreal and subarctic, was very important part of information (Skalický 1988). These data were completed by the maps of distribution of some fauna species.

The differences between various territories in altitudinal vegetation zones, moisture and trophic conditions, variants of altitudinal vegetation zonation and spread of geoelements and differences in recurrent pattern were "summed up". When the "summ" of differences was higher than a certain accepted level, a new bioregion was set up. This work was done without using computers.

In the bioregions so called transition and not-representative zones were set up. Not-representative zones include ecotops that are not typical in this bioregion and in a larger area and better conditions for them are developed in the surrounding bioregions. Transition zones include ecotops that are on the border of two bioregions and biota of these transition zones has no sharp features.

Great problems occure in the territory along the state frontiers, as from Germany and Austria we have had only topographical and geological maps. From Slovakia we have had also some older vegetation division (Dostál 1966), from Poland geobotanical regions (Pawlowski, Szafer, 1978).

In the mentionned way totaly 91 bioregions of the Czech Republic were distinguished: 71 in Hercynian subprovince, 11 in Westcarpathian subprovince, 4 in Polonian subprovince and 5 in Northpannonian subprovince. The area of a bioregion varies from 84 km^2 in the Moravian Karst up to 2883 km^2 in Plzeňský bioregion (bioregion in the surroundings of the Pilsen city).

The characteristics of all bioregions were published some years ago (Culek 1996) thanks to the Ministry of Environment of the Czech Replublic. For every bioregion large characteristics were elaborated in cooperation with local specialists. In each bioregion area, possition, geology, geomorphology, climate, soils, potential and actual vegetation and some specific of forestry are described. The extent of description of a bioregion has about 4 Word-pages.

While working on bioregions, the international cooperation occures very important. Some problems are impossible to be solved in a small area. Very expressive is the problem of bioregions exceeding the state frontiers. Some problems of bordering bioregions could be solved only in neighbouring countries.

A notable remark: Main Nature Units distinguished in Germany by Ssymank and Hauke (Ssymank, Hauke 1994), although they were elaborated independently on the Czech bioregions, have a very good connection on the state border.

4.4. Biochoras

Biochoras are the base biogeographical unites for proposals of ecological network on regional level. Criteria for delimitation and demarcation of biochoras were as follows:

1. There is known specific natural or semi-natural ecosystem (biocoenose) in the territory. This ecosystem is rather different from the surroundings. As the nature of the Czech Republic is mostly very changed, it was necessary to use the analogy. In this case new segment of biochora should differ in altitudinal vegetation tier, soil substratum and georelief – both last on certain level of importace.

2. The area of the biochora segment should be larger than 0,3 km^2 and width of stripe segments should be more than 0,4 km. Smaller territories are incorporated into surrounding biochora.

3. The smaller the territory is, the more contrast from the surroundings it should be.

An example of the type of biochora could be the biochora of rocky valleys with pine forests (*Dicrano-Pinion*) on rocks, lime-maple forests (*Tilio-Acerion*) on the slopes and alders forests (*Alno-Padion*) along the stream.

A large group of analytic and partial synthetic maps was used.

Biochoras - 366 types of them were distinguished in the Czech Republic, in 9186 separated segments. These units are demarcated in the maps of the scale 1:50 000 and are digitalized by the Czech Institution for Nature and Landscape Protection. Characterizations of the types of Biochoras were elaborated too, this huge amount of information was published in recent years (Culek 2005). Some more information is in next table.

Table No. 1. Types of biochoras and their segments in biogeographical subprovinces in the Czech Republic.

Subprovince	**Area in km^2**	**Numer of the biochora types**	**Average area of biochora type in km^2**	**Numer of biochoras segments**	**Average area of the segment in km^2**
Hercynian	66 805	330	-	8 173	8,2
Polonian	1 696	23	-	151	11,2
Westcarpathian	7 104	66	-	617	11,5
Northpannonian	3 265	29	-	245	13,3
CR in total	**78 870**	**366**	**215**	**9 186**	**8,6**

Biochoras were divided according their structure in to sorts of biochoras:

In homogenous biochoras dominate one or two similar potential ecosystems (biocoenoses). The only exception are areas of fountains and floodplains of small streams. These wet ecosystems are usually contrast to surrounding area of biochora, but they apear almost in all biochoras, so they are not taken in account in decision about biochora`s sort.

Similar biochoras consist of complex of similar potential ecosystems (biocoenoses). The only exception are again areas of fountains and floodplains of small streams.

Contrast-similar biochoras are more complicated. Here is, out of predominant similar potential ecosystems (biocoenoses) fontains and small floodplains, another contrast potential ecosystem, one or more. Area of this contrast ecosystem is small.

Contrast biochoras consist minimally of two (mostly three and more) expressively different potential ecosystems (biocoenoses). They are similar in area, no one is dominating.

Presented types and sorts of biochoras are important for decision about a goal state of the biocentra (core areas) and their extend. The more abundant and contrast are the potential ecosystems within the type of biochora, the larger the biocentrum (core area) should be.

4.5. Groups of geobiocoene types

These unites are used for ecological network on local level. An example of such a unit could be the wet fire-spruce forests with horsetail (Abieto-Piceeta equiseti). These unites has their latin names according to professor Zlatník in plural, to be distinguished from the vegetation unites of the Zürich-Montpellier system. In the last study (Buček, Lacina 1999) 150 types of these unites were distinguished in our territory. They are mapped in smaller areas, the whole territory of the Czech Republic is not mapped yet.

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