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# Diptera of Podyjí National Park and its Environs

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# Introductory part

## Podyjí National Park

Podyjí National Park (NP) with 63 km² is the smallest of the four Czech National Parks. The park is situated in a hilly area (207-536 m a.s.l.) in southwestern Moravia in the Dyje River valley between the towns of Vranov nad Dyjí (in the west) and Znojmo (in the east) along the Czech-Austrian state border. The area is unique thanks to the so-called river phenomenon of the Dyje River flowing for more than 30 km in numerous meanders and forming a deeply shaped valley. In the valley, which is up to 200 m deep in some places, slopes of various substrata and orientations occur, supporting a wide scale of habitats ranging from warm and dry habitats such as loess steppe grasslands and thermophilous oak forests to habitats of beech forests which can even host some (sub)montane elements.

### Natural conditions

Podyjí NP was established at the southeastern edge of the Českomoravská vrchovina (highlands), which is mainly formed of crystalline rock. A remarkable landscape element is the 60 to 200 m deep, V-shaped, valley of the Dyje (Thaya) River. The slopes of the valley are steep and dissected by numerous ravines. Outcrops of hard rock are quite frequent. The valley is surrounded by a landscape of rolling hills. The highest point of the area is Býčí hora (hill, 536 m) in the western part of the NP, the lowest point (207 m) is the level of the Dyje River at the eastern edge of the NP.

The area is built of Proterozoic crystalline rock of the Bohemian Massif. In the eastern part of the NP it is overlaid by soft Miocene (Upper Tertiary) deposits. Crystalline rock (gneiss, mica shist, granitoids) is mostly acidic, but outcrops of more base-rich bedrock (amphibolite, marble) are also encountered. Predominantly in the eastern part of the area, Quaternary eolian deposits (loess) are found.

In Podyjí NP, several soil types are developed, with cambisol being predominant. On crystalline plateaux and gentle slopes with a thick layer of weathered material or young deposits, orthic luvisols can be found. Outcrops of ancient hard bedrock are covered by shallow rankers and lithosols. In depressions with springs, gleysols can be encountered. Rendzinas are developed in patches with marble outcrops. On the bottom of the valley, loamy-sandy fluvial deposits can be found. In the eastern part of the area, chernozems are developed on the fine-grained Tertiary or Quaternary deposits, whereas albic luvisols prevail on Neogene sand and gravel.

The climate in the eastern section of the NP is dry and warm. The mean annual temperature in Znojmo-Kuchařovice is 8.8 °C, with 564 mm of mean annual precipitation. Moving to the northwest, the climate becomes increasingly cooler and wetter. The varied terrain of the river valley generates remarkable mesoclimatic patterns. Whereas the gently undulating landscape, at least in the central and north-western part of the area, has oceanic climatic features without distinct minima or maxima, the climate of the river valley is more continental in character. Most continental are the upper parts of the south-facing slopes that may be considerably warm during the daytime but on clear nights cool off to values lower than elsewhere in the valley. There are two types of temperature inversions in the valley. Inversions due to topographical shading mainly affects the lower parts and foots of the north-facing slopes. It is most intense during the daytime and limits the height of temperature maxima. This type of inversion supports the occurrence of montane plants in these habitats. The second type of inversion, due to cold-air drainage, occurs from time to time during clear and calm nights. Particularly in spring, this inversion may cause frost injury to sensitive plants, so that some species of oceanic distribution and even *Fagus sylvatica* are probably out competed in the valley.

## History of nature conservation

After 1948, the whole territory was closed to the public because of its state border status. The Protected Landscape Area Podyjí came into existence in 1978. In the 1980s, research was resumed, and its results were later used as arguments for establishing a national park. This happened in 1991 when Podyjí NP was established on an area of 63 km$^2$, covering nearly the whole territory of the former Protected Landscape Area. Particularly valuable sites, formerly nature reserves, e.g. Hamerské vrásy, Havranické vřesoviště, Hradišťské terasy, Kraví hora, Popické kopečky, and Údolí Dyje, are now protected under the regulations of the first NP zone (core area). The activities on the Czech side of the border were coordinated with those in Austria. On the January 1, 2000, the NP became bilateral through the establishment of the Thaytal National Park in adjacent Austria.

## Vegetation

Podyjí NP is situated in the transitional area between the mesophilous Central-European (Hercynian) and the thermophilous Pannonian floras. The Pannonicum and the Hercynicum have long been commonly accepted phytogeographic regions of Central Europe. According to plant geographic classification, the former is a Province within the Pontic-South Siberian Region, while the latter is a Sub-Province of the Central European Province within the Middle European Region. The boundary generally follows the geological dividing line between the Bohemian Massif in the northwest of the NP (with higher altitudes, lower temperatures, higher precipitation, ancient siliceous bedrock, and a landscape with a patchwork of forest tracks and treeless areas) and the outer depressions of the Carpathians and the Alps in the southeast of the NP (with lower altitudes, a warmer and drier climate, Tertiary and Quaternary deposits, and a landscape largely deforested since prehistoric times).

The predominant vegetation type of the NP is broad-leaved forest. In its western (Hercynian) part, near the towns of Vranov nad Dyjí and Hardegg, submontane beech forests (*Melico-Fagetum, Carici pilosae-Fagetum, and Tilio cordatae-Fagetum; Fagion*) are the main types of potential natural vegetation. They are found in the gently undulating landscape at altitudes above 450 m. Hercynian oak-hornbeam forests (*Melampyro nemorosi-Carpinetum; Carpinion*) are predominant in the central part of the NP and in the river valleys. Moving to the east towards the region of Pannonian flora, oak-hornbeam forests are replaced by acidophilous oak forests and, on the marginal slope of the Bohemian Massif, by thermophilous oak forests (*Sorbo torminalis-Quercetum; Quercion petraeae*). In the outer depressions of the Carpathians which are adjacent to the Bohemian Massif in the east, a mosaic of thermophilous oak forests (*Quercetum pubescenti-roboris, Aceri tatarici-Quercion*) and Pannonian oak-hornbeam forests (*Primulo veris-Carpinetum; Carpinion*) is supposed to be natural; however, this area is largely deforested.

A remarkable vegetation pattern is encountered in the river valleys. The alluvium is covered by riverine alder forests of the association *Stellario-Alnetum glutinosae* (*Alnion incanae*). Lower slopes support ravine forests (*Aceri-Carpinetum; Tilio-Acerion*) in steeper sites and oak-hornbeam forests (*Melampyro nemorosi-Carpinetum*) in gentler sites. South-facing upper slopes are covered by thermophilous oak forests (*Sorbo torminalis-Quercetum* and *Genisto pilosae-Quercetum petraeae*; both *Quercion petraeae*) whereas the slopes of north-facing aspects are the habitat of acidophilous oak forests (*Luzulo albidae-Quercetum; Genisto germanicae-Quercion*). On the tops of ridges and cliffs, small stands of pine forests (*Cardaminopsio petraeae-Pinetum; Dicrano-Pinion*) are found.

The river valley includes patches of primary treeless habitats on cliffs, rock faces and talus slopes. South-facing slopes are dominated by scrub (*Prunion spinosae, Berberidion*) or dry grasslands (*Festucion valesiacae, Seslerio-Festucion glaucae, Alysso-Festucion pallentis*).

North-facing treeless patches are dominated by stands of *Calamagrostis arundinacea* on siliceous bedrock, and by *Sesleria albicans* grassland (*Diantho lumnitzeri-Seslerion*) on marble. Talus slopes are covered with cryptogamic vegetation and, near the forest edges, with species-poor communities of mosses and ferns.

Secondary treeless vegetation is mainly found in the border area of the NP and in the adjacent landscape. In the western and central part, *Arrhenatherion* and *Calthion* meadows are predominant types. *Arrhenatherion* meadows are also found in the Dyje floodplain in deforested sites. The river is fringed by *Phalaridion arundinaceae* riverine reeds with *Phalaris arundinacea* and *Carex buekii*. The largely deforested marginal slope of the Bohemian Massif is well-known for its extensive dry heathland (*Genistion pilosae* with thermophilous and continental species) and acidophilous grasslands (*Koelerio-Phleion phleoidis*). The area of the Carpathian outer depressions is dominated by arable land and vineyards, and the most striking type of semi-natural vegetation there is the *Convolvulo-Agropyrion* grassland in road verges on loess.

## Flora

On the marginal slope of the Bohemian Massif a remarkable transitional zone between the Hercynicum and the Pannonicum is found, situated in a deforested area on siliceous bedrock. It shares species of both phytogeographic regions. Pannonian and Continental species of steppe and ruderal habitats on loess and of subhalophilous sites, e.g. *Alcea biennis, Carex hordeistichos, Kochia prostrata* (only in Austria), *Peucedanum alsaticum, Salvia austriaca* (only in Austria), *Scabiosa canescens, Sclerochloa dura, Scorzonera cana*, and *Seseli hippomarathrum*, are present in the eastern part of the NP. Some thermophilous elements, e.g. *Aconitum anthora, Aurinia saxatilis, Bromus squarrosus, Cruciata pedemontana, Dictamnus albus, Iris variegata, Minuartia fastigiata, Stipa dasyphylla, S. pulcherrima*, and *Veratrum nigrum*, are confined to rock outcrops in the river valleys, which are surrounded by mesophilous vegetation. On marble, *Gentiana cruciata, Inula ensifolia, Orchis militaris*, and *O. purpurea* join this group. Montane species, such us *Aconitum variegatum, Dentaria enneaphyllos, Geranium sylvaticum* (only in Austria), *Hordelymus europaeus, Lunaria rediviva, Lycopodium clavatum, Melampyrum sylvaticum, Petasites albus, Poa chaixii* (only in Austria), *Prenanthes purpurea, Ranunculus platanifolius* (only in Austria), and *Thalictrum aquilegiifolium*, can be mostly found in the river valleys in the western part of the NP where topographical shading controls temperature. Quite remarkable is the presence of perialpine species, which indicate phytogeographical relationship to the Alps. This species group is represented by *Buphthalmum salicifolium, Bupleurum longifolium* (now only in Austria), *Cyclamen purpurascens, Euphorbia angulata, Laserpitium latifolium* (only in Austria), *Polygala amara, Sesleria varia*, and *Thesium alpinum* (only in Austria). The Siberian (taiga) element, here near its south-western distribution limit, is represented by *Carex pediformis* and *Cimicifuga europaea*.

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## Localities studied

Notes: Malaise traps were installed usually at the end of March and removed in October, only in one year were they exposed throughout the winter months (2003-2004, localities: Široká Pole, Vraní skála, Nad Šobesem and Terasy). Co-ordinates were measured by means of GPS III. Miroslav Barták and Štěpán Kubík collected all materials.

**2001:**

a) regularly (throughout the whole vegetation season) sampled localities using Malaise traps, yellow and white pan traps and emergence traps.

1/01: Havraníky (steppe-heathland, 1.5 km SW of Havraníky), 48°48´29´´N 15°59´31´´E, 340 m

2/01: Hnanice (edge of damp deciduous wood, including ecotone and residual growth of reeds, 1.5 km NW of Hnanice), 48°48´12´´N, 15°58´22´´E, 300 m

3/01: Horní Břečkov (wetland near pond, often flooded, 1.5 km W of H. Břečkov), 48°53´28´´N, 15°52´32´´E, 400 m

4/01: Čížovský rybník (pond) (damp meadow and edge of residual lowland wood under Čížovský pond, 1.2 km NE of Čížov), 48°52´55´´N, 15°53´11´´E, 380 m

5/01: Liščí skála (forest - steppe with oak forest, 2.5 km S of Podmolí), 48°49´48´´N, 15°56´28´´E, 420 m

b) irregularly sampled localities.

6/01: Braitava (deciduous wood, 1,5 km SE of Vranov nad Dyjí, 25.vii.), 48°53´23´´N, 15°49´42´´E, 440 m

7/01: Fládnická chata (meadow + dry forest, 1,5 km NW of Hnanice, 30.viii.), 48°48´40´´N, 15°58´04´´E, 350 m

8/01: Pod Šobesem (meadow + lowland wood, 2 km W of Havraníky, 25.vii.), 48°48´46´´N, 15°58´51´´E, 270 m

9/01: Havraníky (steppe, 0,5 km NW of Havraníky, sweeping, 30.viii.), 48°48´53´´N, 15°59´58´´E, 350 m

**2002:**

a) regularly sampled localities using Malaise traps, pan traps and emergence traps, throughout the whole vegetation season.

1/02: Ledové sluje (lowland wood and *Carex* meadow "Pod ledovými slujemi"), 48°53´09´´N, 15°50´29´´E, 290 m

2/02: Zadní Hamry (cold deciduous wood, NE facing slope), 48°53´18´´N, 15°49´54´´E, 320 m
3/02: Braitava letohrádek (old mixed forest), 48°52´35´´N, 15°50´03´´E, 520 m

b) only Malaise traps, throughout the whole season.

4/02: Havraníky (steppe-heathland, sparse growth of *Pinus nigra*), 48°48´52´´N, 15°59´48´´E, 330 m

5/02: Pod Šobesem (lowland wood near river), 48°48´48´´N, 15°58´51´´E, 270 m

c) car netting (started from Vranov nad Dyjí).

6/02: Braitava (two samples: 27.vi. and 30.-31.vii.)

**2003:**

a) regularly sampled localities using Malaise and emergence traps, throughout the whole vegetation season.

1/03: Nad Šobesem (forest - steppe with oak wood, near old fallow above vineyard), 48°49´03´´N, 15°58´39´´E, 340 m
2/03: Terasy (mixed wood, mostly deciduous trees), 48°53´22´´N, 15°50´18´´E, 460 m
3/03: Široká pole (residual lowland strip with willows, etc. close along river), 48°51´30´´N, 15°51´01´´E, 280 m
b) only Malaise traps, throughout the whole season.

4/03: Vraní skála (deciduous wood near stony steppe), 48°51´02´´N, 15°53´37´´E

c) pan traps (only one sample, 1.-2.vi.2003)

5/03: Lesná (mixed wood, 1.7 km SSW of Lesná), 48°53´33´´N, 15°51´16´´E, 470 m

2004:

a) regularly sampled localities using Malaise traps, throughout the whole vegetation season.

1/04: Braitava letohrádek (forest), 48°52´32´´N, 15°50´05´´E, 530 m
2/04: Hardegg vyhlídka (forest), 48°51´30´´N, 15°51´35´´E, 420 m
3/04: Faltýskův mlýn (floodplain wood), 48°50´43´´N, 15°54´08´´E
4/04: Liščí skála (stony steppe with oak wood), 48°49´52´´N, 15°56´35´´E, 410 m
5/04: Fládnická chata (pasture forest), 48°48´42´´N, 15°58´03´´E, 350 m
6/04: Devět Mlýnů (floodplain forest), 48°49´07´´N, 15°58´17´´E, 270 m
7/04: Pod Větrníkem (mixed wood), 48°53´19´´N, 15°51´31´´E, 490 m

b) fly trap baited with decayed meat.

8/04: Čížovský rybník (wetland), 48°52´55´´N, 15°53´11´´E, 380 m

**Material depositories**

If not stated otherwise, all dried documentary materials of the families are deposited in the private collections of M. Barták and Š. Kubík (now deposited in the Czech University of Agriculture, Prague). All materials stored in alcohol are deposited in the collections of the first authors of particular chapters, e.g. Trichoceridae, Tipulidae, Limoniidae in coll. J. Starý (Olomouc), Sciaroidea in coll. J. Ševčík and Silesian Museum (Opava), Phoridae in coll. Museum Hradec Králové, Ceratopogonidae in coll. A. Tóthová (Brno), Simuliidae in coll. J. Knoz (Brno).

## Review of dipterological investigations in Podyjí National Park

RUDOLF ROZKOŠNÝ

An attempt at a survey of entomological papers concerning Podyjí NP was recently published by MARSOVÁ (2004). Nevertheless, the part devoted to dipterological research and the relevant references are essentially extended herewith.

Probably the first reliable data were published by two Austrian entomologists, viz., WACHTL (1883, 1884, 1885, 1886, 1887) and HANDLIRSCH (1885). Among their interesting achievements were the discovery of several new species.

Friedrich A. Wachtl (1840-1913) was born in the Breitov game-keeper´s lodge and attended Znojmo secondary school. Apparently he visited the vicinity of Znojmo several times between 1880-1910, i.e. in the time when he was active as a head of the Forestry Research Institute in Mariabrunn near Vienna and, since 1895, as a professor of forest conservation and forest entomology at the Hochschule für Bodenkultur in Vienna. From the Znojmo environs he described three new species of gall-midges, all being still valid: *Jaapiella moraviae* (Wachtl, 1883), *Ozirhincus millefolii* (Wachtl, 1884) and *Dasineura potentillae* (Wachtl, 1885). The main part of the Wachtl´s dipterological collection is, according to TSCHORSNIG & HERTING (2005), deposited in the Tiroler Landesmuseum Ferdinandeum in Innsbruck and partly (about 10 %) also in the Hochschule für Bodenkultur in Vienna. Among Diptera preserved in the Wachtl´s collections are also many valuable and preserved documentary specimens from today´s Podyjí NP. TSCHORSNIG & HERTING (l.c.), who recently studied the Tachinidae, found 119 species among more than 1350 specimens from Znojmo (labelled as "Moravia Znaim"). Though the Tachinidae was one of Wachtl´s favourite families, there is no doubt that many interesting species from Podyjí NP are included in the material of other, so far not revised, families of Diptera.

Anton Handlirsch (1865-1935), another Austrian entomologist, being known as a custodian and, since 1922, a chief of the Naturhistorisches Museum in Vienna, described from the vicinity of Vranov nad Dyjí a still valid gall-midge *Geocrypta braueri* (Handlirsch, 1885). His further new species from Clusiidae, *Clusia mikii* Handlirsch, 1885, is now considered a synonym of *Paraclusia tigrina* (Fallén, 1820). NOWAKOWSKI (1967, see also 1973) described from Handlirsch´s Vranov nad Dyjí material a new species, *Cerodontha handlirschi* Nowakowski, 1967 and LAŠTOVKA & MÁCA (1982), a new species, *Stegana similis* Laštovka & Máca 1982. Also DUDA (1918) examined Handlirsch's specimens and recorded 3 species, including a new one, *Limosina antennata* Duda, 1918, now synonym of *Pullimosina moesta* (Villeneuve, 1918). ŠIFNER (1978) examined two species of Scathophagidae from the Handlirsch´s collection originating from the same locality.