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## FLORA OF THE EASTERN PART OF THE OPAWSKIE MOUNTAINS IN SOUTHWEST POLAND

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**ABSTRACT:** The paper presents the results of floristic investigation in south-eastern part of the Opawskie Mountains range in the Opole Silesia region, SW Poland. Flora of that area despite some anthropogenic changes during last hundreds of years survive very natural and comprise in total, 788 vascular plant species, the natives in great majority. This flora, besides its unique richness, is distinctive for the number of threatened species in regional scale (128 taxa). Two species of orchids i.e. *Dactylorhiza sambucina* and *Orchis mascula*, have their last refuges within the studied area. There are also some withdrawals, the most important is the disappearance of *Gentianella bohemica*, *Campanula cervicaria*, *Sedum villosum*, *Spiranthes spiralis*, *Phyteuma orbiculare* and *Pinguicula vulgaris*. The main reason of that is mainly the intensification of agriculture.

Human activity connected with farming, and to a smaller extent mining and village enlargements, were the main reason of synanthropisation of flora of the considered area. However, indices of synanthropisation and anthropophytisation of flora, which are 45.6 and 18.5% respectively, are lower there than for flora of the whole voivodeship (ca. 58% and 26%). So, the flora of the Opawskie Mts. could be still regarded as very valuable in conservation as well as scientific terms.

**KEY WORDS:** Opawskie Mountains, flora, synanthropisation, *Dactylorhiza sambucina*, *Orchis mascula*, Opole Silesia

### **Introduction**

The Opawskie Mountains is the eastern most range of the Sudety Mountains, with the slopes descending directly to the lows of the Moravia Gate. At the north and the east it is limited by the Głubczyce Plateau, at the south – by Hruby Jeseník and Brantická Vrchovina, and the west – Rychlebské Hory and Paczków Foothills. Northern and eastern fragments of this mountain range belong to Poland, and at the side of the Czech Republic it is called Zlatohorská Vrchovina. According to the physical and geographical classification of Kondracki (2000), the Opawskie Mts in Poland are divided into two enclaves. The main one (western), with the highest peak of the range - Kopa Biskupia (890.6 m a.s.l.), extends from settlements of Głuchołazy to Krzyżkowice, and the less known south-eastern part, is situated to SW from Głubczyce, with the highest unnamed hill of 541.3 m a.s.l. (Fig. 1). In total, the area of the Opawskie Mts is ca 250 km<sup>2</sup>, and their latitudinal range is ca 32 km.

The Opawskie Mts is an example of block mountains with moderate domed hills of relatively gentle slopes and small relative elevations within the range of 150-200 m. More steep slopes, reaching even 60° occur only in incised valleys of streams (e.g. Biała Głuchołaska or Złoty Potok), where, similarly as in top parts of the greatest concentrations of rock outcrops are recorded (Sitko 1998).

Geological structure of the Opawskie Mts. is diverse. Devonian shales (phyllite, mica and quartzite) predominate there, as well as gneiss, amphibolite, granite, and in some places also limestone and crystalline limestone. In the eastern part in surface layers greystone and sandstone are often. In many places, old rocks are covered with layers of loess, and glacial sands and gravels. A typical feature of the Opawskie Mts is occurrence of remarkable ingredient of gold, which was exploited until the XVIIth century (Sitko 1998).

Soils of the Opawskie Mts are usually shallow brown deposits formed in the effect of erosion of shale. Weakly decomposed litter and a relatively thick layer of dark grey humus are typical of these mountains (Krawiecowa et al. 1963). Their reaction oscillates around the value of 5 pH.

Opawskie Mts. are among the warmest mountains in Poland with the mean yearly temperature of 7-8.5° at the foothills and ca. 4.5° on the top of Kopa Biskupia. Precipitation is at the level of ca. 800 mm in higher parts and ca. 650 mm in lower parts. There happen heavy downpours that may give 24-hour precipitation level of 187 mm (July 1997). Snow cover remains there on an average for ca 48-60 days in a year and the number of days with frost is from 31 in Głuchołazy to ca. 45 on the top of Kopa Biskupia.

Vegetation cover in the Polish part of the Opawskie Mts is characterised by a low level of anthropogenic changes. Broadleaved and coniferous forests predominate there. Spruce or larch monocultures comprise ca 35% of the forest area. In the lower forest zone beech woodlands prevail, on slopes mainly *Luzulo luzuloidis-Fagetum*, in lows of streams (e.g. of Bystry Potok) also *Dentario enneaphyllidis-Fagetum*. In this vegetation zone, acid oak woodlands *Luzulo luzuloidis-Quercetum* are well-represented. Large

fragments of this forest cover slopes of hills in the eastern part of the Opawskie Mts and of the peaks of Góra Zamkowa, Olszak and Góra Bukowa. Higher parts of lower forest zone have been remarkably changed by spruce plantings, often with poor undergrowth. Because of planting spruce in the XIXth and the XXth centuries, the occurrence of natural spruce woodlands in the Opawskie Mts is unclear. Absolute elevations impede formation of this zone, however a sole hill of Kopa Biskupia and a characteristic sharpening of the climate of such solitaires indicate that perhaps further detailed studies and analyses are needed to finally explain the question of occurrence of natural spruce woodlands in the Opawskie Mts.

Valleys of mountain streams are covered by submontane ash carrs *Carici remotae-Fraxinetum*, in higher parts of the valley of Bystry Potok they have a high proportion of grey alder. On slopings and lower slopes dry-ground forests *Galio sylvatici-Carpinetum* occur.

Along streams there are often communities of wet edges from the sub-class *Galio-Urticenea* with frequent communities *Petasitetum albi* and *Geranio phaei-Urticetum*. Besides woodlands, especially at the sides of stream valleys wet meadows occur, in particular from alliances *Calthion*, *Molinion*. Thistle meadow *Cirsietum rivularis* is frequent. Swards of the order *Sedo-Scleranthetalia* and rock surface communities from the alliance *Asplenion septentrionalis* and the order *Androsacetalia vandellii* cover rocks, especially of the southern exposure.

Forest clearings are often occupied by associations from the class *Epilobietea angustifoliae* with their rare representative – association *Atropetum belladonnae*.

The so far conducted floristic investigations in the Opawskie Mts. considered mainly its western part. From this area, 795 taxa were reported (Krawiecowa et al. 1963).

The western part of the Opawskie Mts was in 1988 covered by protection as a landscape park, and the eastern part – as an area of protected landscape. Extension of the park on the whole territory of the Opawskie Mts has been postulated for a few years (Nowak and Nowak 2004a). In the Opawskie Mts. there are 3 nature reserves: „Cicha Dolina” in the Valley of the Bystry Stream, which protects beech woodlands of the lower forest zone, „Las Bukowy” situated on the northern slopes of Góra Parkowa, which protects acid beech forests, and „Nad Białką” located on the western slopes of Góra Parkowa, which protects the gorge of the stream of Biała Głuchołaska and remains of former gold mining. In the eastern part of mountains there is a proposed nature reserve „Pielgrzymów”, aimed at protection of acid oak forests with a population of *Dacylorhiza sambucina*.

The aim of the present study is to extend the knowledge on the flora of the Opawskie Mts. Earlier studies and reports considered mostly only the western part of this range. The eastern part, of an almost equal area, has been omitted for unknown reasons. However, this is a very interesting wildlife enclave, similar to areas of the western part in the region of Prudnik, with elevations reaching 550 m, numerous streams and picturesque valleys, rocks and diverse slopes. Small villages in this area and

relatively extensive agricultural practice allowed for preservation of ecosystems unchanged for years.

### **Methods**

Systematic surveys of the distribution of flora were conducted in vegetation seasons 2005-2006. Before that period, irregular botanical excursions have been also conducted and their results were considered in this paper. Floristic inventories were conducted in all distinctive types of habitats within the borders of the Opawskie Mts., i.e. in settlements: Ciermęcice (Ci), Chróstno (Co), Lewice (Lw), Lenarcice (Le), Bliszczycze (Bl), Braciszów (Br), Chomiąza (Ch), Krasne Pole (KP), Opawica (Op), Dobieszów (Db), Pielgrzymów (Pi), Radynia (Ra), Mokre (Mo), Mokre-Kolonia (MK), Grodzie (Gr), Zubrzyce (Zu), Zopowy (Zo) and Pietrowice Głubczyckie (PG) (Fig 1).

In the species list the frequency of occurrence of a taxon was given: 1 – very rare (1-2 locations), 2 – rare (3-5 locations), 3 – moderately frequent (6-10 locations), 4 – frequent (11-19), 5 – common (more than 19 locations).

The literature data were taken both from published papers, with their data included in ATPOL database, and from new papers from the period 1998-2005.

Species names follow Mirek et al. (2002).

To present the synanthropodynamic stage of flora, the indices of flora synanthropisation were calculated (Jackowiak 1990):

- index of flora synanthropisation (total and permanent)

$$WS_c = \frac{Ap + An}{Sp + An} \times 100\% \qquad WS_t = \frac{Ap + Meta}{Sp + Meta} \times 100\%$$

- index of flora apophytisation (total and permanent)

$$WAp_c = \frac{Ap}{Sp + An} \times 100\% \qquad WAp_t = \frac{Ap}{Sp + Meta} \times 100\%$$

- index of apophytism of spontaneophytes

$$WAp = \frac{Ap}{Sp} \times 100\%$$

- index of flora antropophytisation (total and permanent)

$$WAn_c = \frac{Ap}{Sp + An} \times 100\% \qquad WAn_t = \frac{Meta}{Sp + Meta} \times 100\%$$



- index of flora archeophytisation

$$WArch_c = \frac{Arch}{Sp + An} \times 100\%$$

$$WArch_t = \frac{Arch}{Sp + Meta} \times 100\%$$

- index of flora kenophytisation

$$WKen_c = \frac{Ken}{Sp + An} \times 100\%$$

$$WKen_t = \frac{Ken}{Sp + Meta} \times 100\%$$

- index of flora modernisation

$$WM \frac{Ken}{Meta} \times 100\%$$

- index of flora fluctuations

$$WF = \frac{Efem}{Sp + An} \times 100\%$$

Explanations: An – antropophytes, Ap – apophytes, Arch – archeophytes, Ken – kenophytes, Sp – spontaneophytes, Meta – metaphytes (*sensu* Jackowiak 1990)

### **Results**

In total, in the studied area 788 species of the vascular plants were stated (Appendix 1). The majority of taxa given in the literature were confirmed. Only 36 of the described species were not encountered at present.

Among the recorded taxa, native species decidedly predominated.

Unfortunately, during last few decades the studied area lost many important species, e.g.: *Gentianella bohemica*, *Gentiana pneumonanthe*, *Drosera rotundifolia*, *Campanula cervicaria*, *Bupleurum falcatum*, *Asplenium septentrionale*, *Centaurium pulchellum*, *Corallorhiza trifida*, *Coeloglossum viridae*, *Melampyrum sylvaticum*, *Pulmonaria angustifolia*, *Sedum villosum*, *Spiranthes spiralis*, *Phyteuma orbiculare*, *Pinguicula vulgaris*, *Moneses uniflora*, *Laserpitium prutenicum* or *Viola mirabilis*.

Among the found plants, 128 species were included in the Red List of Vascular Plants of the Opole voivodeship (Nowak et al. 2003), among them – 7 in the category of extinct (RE), 7 – critically endangered (CR), 16 – endangered with extinction (EN), 36 – vulnerable (VU), 30 – nearly threatened (NT), 27 – of least concern (LC) and 5 – data deficient (DD).

In the flora of the studied area prevail very rare species (214 taxa) and rare (196) species. Less common are frequent (170) and moderately frequent (123) plants. The smallest group are common species (85).

Among 788 taxa there are 146 alien species, out of which 82 are archaeophytes, 53 kenophytes and 11 diaphytes. Spontaneophytes are the most numerous – as many as 429, apophytes are 213.

According to the accepted methodology, there were calculated: the index of total ( $WS_c$ ) and permanent ( $WS_t$ ) synanthropisation and indices of apophytisation of flora (total and permanent -  $WAp_c$  and  $WAp_t$ ), apophytism of spontaneophytes ( $Wap$ ), antropophytism of flora ( $WAn_c$  and  $WAn_t$ ), kenophytisation ( $WKen_c$  and  $WKen_t$ ), archaeophytisation ( $WArch_c$  and  $WArch_t$ ) and modernisation ( $WM$ ) of flora and the index of fluctuation changes ( $WEf$ ) in the flora of the studied area (Tab. 1, 2).

Tab. 1. Values of indices of synanthropisation, apophytisation, apophytism of spontaneophytes and antropophytism of flora (symbols given in methods)

Type of index	$WS_c$ [%]	$WS_t$	$WAp_c$	$WAp_t$	$Wap$	$WAn_c$	$WAn_t$
	45.6	44.8	27.0	27.4	49.6	18.5	17.4

Tab. 2. Values of indices of archaeophytisation, kenophytisation, modernisation and fluctuation changes in flora (symbols given in methods)

Type of index	$WArch_c$	$WArch_t$	$WKen_c$	$WKen_t$	$WM$	$WEf$
	10.4	10.5	6.7	6.8	39.2	1.4

### Discussion

Flora of the eastern part of the Opawskie Mts is distinctive by its richness in comparison with other regions of the Opole Silesia having a similar area. In total, 788 species were stated, i.e. only 7 less than in the main, northern part of the mountain range.

This flora, besides its unique richness, is distinctive for the number of threatened species, which are 128 in this area – i.e. ca 25% of the whole regional Red List. Two species of orchids are worth attention, i.e. *Dacylorhiza sambucina* and *Orchis mascula*, having in the studied area their last populations in the region. Unfortunately, 36 species which had been recorded earlier, were not confirmed. Among them, a part has a status of species extinct in the whole region – e.g. *Gentianella bohémica*, *Campanula cervicaria*, *Sedum villosum*, *Spiranthes spiralis*, *Phyteuma orbiculare* or *Pinguicula vulgaris*. Habitat requirements of extinct and not confirmed species show that the main reason of their disappearance is intensive agriculture – change of meadows and pastures to arable land, elimination of baulks and small fallows, perhaps also mining which was decisive in the case of *Gentianella bohémica*.

Human activity connected with farming, and to a smaller extent - mining and village enlargements, were the main reason of synanthropisation of flora of the eastern part of the Opawskie Mts. However, indices of synanthropisation and anthropisation of flora, which are 45.6% and 18.5% respectively, are lower there than for flora of the whole voivodeship (ca. 58% and 26%). There is a very low proportion of the youngest immigrants, i.e. kenophytes and diaphytes, in the total number of species. The foundations of flora are native species occurring usually in their typical habitats.

Independently of changes caused by anthropopressure, flora of the eastern part of the Opawskie Mts can be recognised as one of the most interesting and valuable at the scale of the Opole region in conservation terms. Drawing attention of nature protection services to this area and upgrading of its protection status to the landscape park seems to be important. Because of the progressing succession and forest management (afforestation) designation of the nature reserve in Pielgrzymów seems to be urgent for preservation of a rich location of *Dacylorhiza sambucina* and other valuable taxa.

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#### **Appendix. 1. Alphabetical list of species**

1. *Abies alba* Mill.; 3, (!), Pi, Op, KP, PG, Ci, LC, Sp,
2. *Acer campestre* L.; 2, (!), Ra, Zu, PG, Sp,
3. \* *Acer negundo* L.; 1, (!), Ch, K,
4. *Acer platanoides* L.; 4, (!), frequent within the area, Sp,
5. *Acer pseudoplatanus* L.; 4, (!), frequent within the area, Sp,
6. *Achillea collina* Becker ex Rchb.; 1, (!), Ch, Ap,
7. *Achillea millefolium* L.; 5, (!), common within the area, Ap,
8. *Achillea ptarmica* L.; 1, (!), MK, Op, LC, Sp,
9. *Acinos arvensis* (Lam.) Dandy; 1 (!), PG, KP, Ap,
10. *Actaea spicata* L.; 2 (!), Pi, Gr, Op, LC, Sp,
11. \* *Acorus calamus* L.; 1 (ATPOL), K,
12. *Adoxa moschateliana* L.; 2, (!), Op, Ra, Br, Sp,
13. *Aegopodium podagraria* L.; 5, (!), common within the area, Sp,
14. \* *Aesculus hippocastanum* L.; 2, (!), Ra, KP, Ci, Mo, Zu, Zo, Co, K,
15. *Aetusa cynapium* L.; 3, (!), Op, Ra, MK, Zu, Zo, Lw, Ap,
16. *Agrimonia eupatoria* L.; 2, (!), PG, Ci, Co, Pi, Do, Ap,
17. \* *Agrostemma githago* L.; 1, (!), Ci, LC, Arch,
18. *Agrostis capillaris* L.; 3, (!), Do, Ra, Op, Ci, Ch, Ap,
19. *Agrostis gigantea* Roth.; 2, (!), Op, Pi, Do, Br, Ap,
20. *Agrostis stolonifera* L.; 2, (!), Op, KP, Le, Bl, MK, Sp,

21. *Ajuga genevensis* L. ; 2, (!), Ch, Ci, Br, NT, Ap,
22. *Ajuga reptans* L.; 4, (!), frequent within the area, Sp,
23. *Alchemilla acutiloba* Opiz; 1, (!), Gr, Sp,
24. *Alchemilla glabra* Neygenf.; 2, (!), Gr, Ra, Br, Sp,
25. *Alchemilla gracilis* Opiz; 1, (!), Br, Sp,
26. *Alchemilla monticola* Opiz; 3, (!), Br, Op, Pi, Gr, Le, Ci, Sp,
27. *Alisma plantago-aquatica* L.; 1, (!), Op, Sp,
28. *Alliaria petiolata* (M. Bieb.) Cavara & Grande; 5, (!), common within the area, Sp,
29. *Allium oleraceum* L.; 2, (!), Pi, Do, Br, Ra, Sp,
30. *Allium ursinum* L.; 1, (!), Ra, Br, Sp,
31. *Allium vineale* L.; 2, (!), Br, Pi, Zu, Bl, Op, Ap,
32. *Alnus glutinosa* (L.) Gaertn.; 4, (!), frequent within the area, Sp,
33. *Alnus incana* (L.) Moench; 1, (!), Op, Pi, Ap,
34. *Alopecurus aequalis* Sobol.; 1, (!), Op, Ch, Sp,
35. *Alopecurus geniculatus* L.; 1, (!), Op, Sp,
36. *Alopecurus pratensis* L.; 3, (!), Op, Ra, Br, Bl, MK, Mo, Sp,
37. *Alyssum alyssoides* (L.) L.; 1, (!), PG; NT, Ap,
38. \* *Amaranthus chlorostachys* Willd.; 1, (!), Do, K,
39. \* *Amaranthus retroflexus* L.; 2, (!), Op, Do, KP, PG, K,
40. \* *Anagallis arvensis* L.; 4, (!), frequent within the area, Arch,
41. *Anchusa arvensis* (L.) Bieb.; 3, (!), KP, Op, Ci, Bl, PG, Ra, Arch,
42. *Anchusa officinalis* L.; 1, (!), VU; PG, Ap,
43. *Anemone nemorosa* L.; 5, (!), common within the area, Sp,
44. *Anemone ranunculoides* L.; 1, (!), Pi, Br, LC, Sp,
45. *Angelica archangelica* L. subsp. *litoralis* (Fr.) Thell.; 1, (!), Ch, Ap,
46. *Angelis sylvestris* L.; 2, (!), Ra, MK, Br, Bl, Sp,
47. *Antennaria dioica* (L.) Gaertn.; 1, (!), Pi (Nowak, Nowak 2003), VU, Sp,
48. \* *Anthemis arvensis* L.; 3, (!), Zu, Zo, Lw, Le, Op, Ra, Arch,
49. \* *Anthemis cotula* L.; 2, (!), Op, Ra, PG, Co, Bl, Arch,
50. \* *Anthemis ruthenica* M. Blied.; 1, (!), PG, Do, K,
51. *Anthemis tinctoria* L.; 1, (!), Mo (Schube 1911), PG, EN, Sp,
52. *Anthoxanthum odoratum* L.; 3, (!), MK, Op, Pi, PG, Ci, Co, Ap,
53. *Anthriscus nitida* (Wahlenb.) Hazsl.; 1, (!), VU, Ch, Bl, Op, Sp,
54. *Anthriscus sylvestris* (L.) Hoffm.; 4, (!), frequent within the area, Sp,
55. *Anthyllis vulnearia* L.; 2, (!), PG, Ch, Op, Co, Sp,
56. \* *Apera spica-venti* (L.) P. Beauv.; 5, (!), common within the area, Arch,
57. \* *Aphanes arvensis* L.; 4, (!), frequent within the area, Arch,
58. *Aquilegia vulgaris* L.; 1, Ch (Schube 1912), VU, Sp,
59. *Arabidopsis thaliana* (L.) Heynh.; 3, (!), Op, Pi, DO, Br, Ci, Co, KP, PG, Ap,
60. *Arabis glabra* (L.) Bernh.; 2, (!), PG, Ch, Ci, Br, Ap,
61. *Arctium lappa* L.; 2, (!), Pi, KP, Ch, Bl, Ap,
62. *Arctium minus* (Hill) Bernh.; 1, (!), Br, Ap,

63. *Arctium tomentosum* Mill.; 2, (!), Br, Op, Bl, Ap,  
 64. *Arenaria serpyllifolia* L.; 4, (!), frequent within the area, Ap,  
 65. \* *Aristolochia clematitidis* L.; 1, PG (Schube 1910) , Dia,  
 66. *Armeria maritima* (Mill.) Willd.; 2, (!), Ch, Op, Ci, Sp,  
 67. \* *Armoracia rusticana* P. Gaertn., B. Mey & Schreb.; 3, (!), Ch, PG, Bl, Zu, Zo,  
 Arch,  
 68. *Arrhenatherum elatius* (L.) P. Beauv. ex. J Presl & C. Presl; 5, (!), common within  
 the area, Ap,  
 69. *Artemisia absinthium* L.; 2, (!), Mo, PG, Ci, Lw, Arch,  
 70. *Artemisia campestris* L.; 2, (!), Lw, Le, Ci, Do, Mo, Ap,  
 71. *Artemisia vulgaris* L.; 4, (!), frequent within the area, Ap,  
 72. *Aruncus sylvestris* Kostel.; 1, (!), PG (Schube 1930), Do (Sendek 1965, Nowak,  
 Nowak 2003), Mo (Fiek 181, Schube 1903), Op (Nowak, Nowak 2003), VU, Sp,  
 73. *Asarum europaeum* L.; 3, (!), Op, Pi, Do, Br, Lw, Sp,  
 74. *Asparagus officinalis* L.; 1, (!), PG, Dia,  
 75. *Asperugo procumbens* L.; 1, (!), Zu, Ap,  
 76. *Asplenium ruta-muraria* L.; 2, (!), Pi, Ch, Br, Sp,  
 77. *Asplenium septentrionale* (L.) Hoffm.; 1, Op (Schube 1903), NT, Sp,  
 78. *Asplenium trichomanes* L.; 2, (!), Pi, Ch, Br, LC, Sp,  
 79. \* *Aster novi-belgii* L.; 3, (!), Op, Lem Ch, Bl, MK, K,  
 80. *Astragalus cicer* L.; 1, (!), PG; LC, Ap,  
 81. *Astragalus glycyphyllos* L.; 3, (!), MK, Op, Do, Ra, Bl, Zo, Lw, Sp,  
 82. *Astrantia major* L.; 1, (!), Pi, NT, Sp,  
 83. *Athyrium filix-femina* (L.) Roth; 5, (!), common within the area, Sp,  
 84. *Atriplex patula* L.; 1, (!), PG, Ap,  
 85. *Atriplex prostrata* Boucher ex DC.; 2, (!), Do, Ra, Zu, Lw, Ap,  
 86. *Atropa belladonna* L.; 1, (!), Op (Schube 1903), PG; EN, Sp,  
 87. \* *Avena fatua* L.; 1, (!), PG, Arch,  
 88. *Avenula pubescens* (Huds.) Dumort.; 4, (!), frequent within the area, Ap,  
 89. \* *Ballota nigra* L.; 1, (!), Op, Zu, Arch,  
 90. *Barbarea stricta* Andrz.; 1, (!), VU, PG, Ap,  
 91. *Barbarea vulgaris* R. Br.; 5, (!), common within the area, Ap,  
 92. *Batrachium aquatile* (L.) Dumort.; 1, (!), Op, Sp,  
 93. *Bellis perennis* L.; 5, (!), common within the area, Ap,  
 94. *Berberis vulgaris* L.; 1, (!), Op, Ch, Ap,  
 95. \* *Berteroa incana* (L.) DC.; 3, (!), MK, Br, Ch, Ci, Lw, KP, Ap,  
 96. *Berula erecta* (Huds.) Coville; 2, (!), Op, MK, Ch, Sp,  
 97. *Betonica officinalis* L.; 2, (!), Ra, Pi, Br, Sp,  
 98. *Betula obscura* Kotula; 1, (!), NT, Op, Pi, Ap,  
 99. *Betula pendula* Roth.; 5, (!), common within the area, Sp,  
 100. *Betula pubescens* subsp. *pubescens* Ehrh.; 1, (!), Pi, Br, Sp,  
 101. *Bidens cernua* L.; 2, (!), Bl. Ch, Op, Ap,

102. \* *Bidens frondosa* L.; 1, (!), Op, K,
103. *Bidens tripartita* L.; 2, (!), Op, Ch, KP, Bl, Ap,
104. *Brachypodium pinnatum* (L.) P. Beauv.; 2, (!), Op, Pi, Do, Ci, Br, Lw, Ch, Sp,
105. *Brachypodium sylvaticum* (Huds.) P. Beauv.; 3, (!), Pi, Ra, Gr, Br, KP, PG, Sp,
106. *Briza media* L.; 4, (!), frequent within the area, Sp,
107. *Bromus benekenii* (Lange) Trimen; 1, (!), Gr, DD, Sp,
108. *Bromus hordaceus* L.; 4, (!), frequent within the area, Ap,
109. \* *Bromus sterilis* L.; 3, (!), Br, Op, KP, PG, Ci, Co, Ch, Arch,
110. \* *Bromus tectorum* L.; 4, (!), frequent within the area, Arch,
111. \* *Bryonia alba* L.; 2, (!), MK, Ra, Do, Zu, K,
112. *Bupleurum falcatum* L.; 1, PG (Schube 1903), CR, Sp,
113. *Calamagrostis arundinacea* (L.) Roth; 2, (!), Pi, Op, Br, Bl, Sp,
114. *Calamagrostis epigejos* (L.) Roth; 4, (!), frequent within the area, Ap,
115. *Calamagrostis villosa* (Chaix) J. F. Gmel.; 1, (!), Op, Sp,
116. \*\* *Calendula officinalis* L.; 1, (!), Br, Dia,
117. *Calluna vulgaris* (L.) Hull; 2, (!), KP, PG, Do, Sp,
118. *Caltha palustris* L.; 1, (!), Ra, Sp,
119. *Calystegia sepium* (L.) R. Br.; 3, (!), Op, Do, Zu, Zo, Ci, Lw, Le, Ap,
120. *Campanula cervicaria* L.; 1, Gr (Schube 1903), RE, Sp,
121. *Campanula glomerata* L.; 2, (!), Do (Ciaciura 1965), Lw, Br, VU, Sp,
122. *Campanula patula* L.; 3, (!), Pi, Do, Op, KP, PG, Ci, Sp,
123. *Campanula persicifolia* L.; 2, (!), Op, KP, PG, Sp,
124. *Campanula rapunculoides* L.; 1, (!), PG, Ap,
125. *Campanula rotundifolia* L.; 3, (!), Br, Pi, Ch, Sp,
126. *Campanula trachelium* L.; 3, (!), Pi, Op, Br, Bl, Gr, Sp,
127. *Capsella bursa-pastoris* (L.) Medik.; 5, (!), common within the area, Arch,
128. *Cardamine amara* subsp. *amara* L.; 2, (!), Ra, MK, Op, Bl, Sp,
129. *Cardamine impatiens* L.; 1, (!), Pi, Gr, NT, Ap,
130. *Cardamine parviflora* L.; 1, (!), Gr, DD, Sp,
131. *Cardamine pratensis* L.; 4, (!), frequent within the area, Sp,
132. *Cardaminopsis arenosa* (L.) Hayek; 3, (!), Br, Do, Op, PG, Mo, Zu, Ci, Lw, Ap,
133. \* *Cardaria draba* (L.) Desv.; 3, (!), Le, Ch, Br, Lw, Do, K,
134. \* *Carduus acanthoides* L.; 4, (!), frequent within the area, Arch,
135. *Carduus crispus* L.; 3, (!), Op, Pi, Bl, Ch, Mo, Ap,
136. *Carex acutiformis* Ehrh.; 1, (!), Ra, Sp,
137. *Carex bohémica* Schreb.; 1, (!), Br, LC, Sp,
138. *Carex brizoides* L.; 5, (!), common within the area, Ap,
139. *Carex canescens* L.; 1, (!), Op, Sp,
140. *Carex caryophyllea* Latourr.; 1, (!), Ch, Br, VU, Sp,
141. *Carex diandra* Schrank; 1, (!), m. Ra a KM (Nowak, Nowak 2003), VU, Sp,
142. *Carex digitata* L.; 2, (!), Op, Br, Ra, Sp,
143. *Carex distans* L.; 2, (!), Ra, Gr, MK, Sp,



144. *Carex disticha* Huds.; 1, (!), Br, MK; NT, Sp,  
 145. *Carex echinata* Murray; 4, (!), frequent within the area, Sp,  
 146. *Carex elongata* L.; 2, (!), Op, Ch, Bl, Sp,  
 147. *Carex flacca* Schreb.; 2, (!), Pi, Br, Ci, PG, Ap,  
 148. *Carex flava* L.; 1, (!) Pi, Ra, Sp,  
 149. *Carex gracilis* L.; 2, (!), Op, Pi, Sp,  
 150. *Carex hirta* L.; 5, (!), frequent within the area, Ap,  
 151. *Carex leporina* L.; 4, (!), frequent within the area, Sp,  
 152. *Carex montana* L.; 1, (!), Lw (Schube 1914), Lw, VU, Sp,  
 153. *Carex nigra* Reichard; 1, (!), Pi, Sp,  
 154. *Carex pairae* F. W. Schultz; 2, (!), VU, Pi, Op, Ra, Sp,  
 155. *Carex pallescens* L.; 4, (!), frequent within the area, Sp,  
 156. *Carex panicea* L.; 2, (!), Pi, Ra, MK, Sp,  
 157. *Carex pilosa* Scop.; 1, (!), Gr, Bl, EN, Sp,  
 158. *Carex pilulifera* L.; 1, (!), Gr, VU, Sp,  
 159. *Carex remota* L.; 2, (!), Pi, Op, Br, Ra, Sp,  
 160. *Carex riparia* Curtis; 1, (!), Op, Ch, Sp,  
 161. *Carex rostrata* Stokes; 2, (!), Pi, Op, Ch, Sp,  
 162. *Carex spicata* Huds.; 1, (!), Op, KP, Bl, Sp,  
 163. *Carex sylvatica* Huds.; 5, (!), common within the area, Sp,  
 164. *Carex vesicaria* L.; 2, (!), Pi, MK, Ra, Sp,  
 165. *Carex vulpina* L.; 4, (!), frequent within the area, Sp,  
 166. *Carlina acaulis* L.; 3, (!), PG (Schube 1913, Ciaciura 1962), Mo, Br (Małdalski et al. 1963), PG, Op, Lw, LC, Ap,  
 167. *Carlina vulgaris* L.; 2, (!), PG, Ci, Op, Ap,  
 168. *Carpinus betulus* L.; 5, (!), common within the area, Sp,  
 169. *Carum carvi* L.; 4, (!), frequent within the area, Sp,  
 170. \* *Centaurea cyanus* L.; 3, (!), Pi, Op, KP, PG, Bl, MK, Zu, Arch,  
 171. *Centaurea jacea* L.; 3, (!), Op, Pi, Ra, Do, MK, Mo, Lw, Sp,  
 172. *Centaurea oxylepis* (Wimm. & Grab.) Hayek; 4, (!), frequent within the area, Sp,  
 173. *Centaurea pseudophrygia* C. A. Mey.; 2, (!), na SW od Do, PG (Nowak 2005), Op, Ch, Br, DD, Sp,  
 174. *Centaurea scabiosa* L.; 2, (!), Ci, Op, Br, PG, Sp,  
 175. *Centaurea stoebe* L.; 2, (!), Br, Ci, Ap,  
 176. *Centaureum erythraea* Rafn subsp. *erythraea*, 2, (!), Br, Ch, na W od Lw, na NW od Do i na S od Pi (Nowak, Nowak, Spałek 2000), NT, Sp,  
 177. *Cephalanthera longifolia* (L.) Fritsch; 2, (!), Gr (Schube 1914), Ra (Dajdok et al. 1998a), na SW od Do, Co, na NW od Ra (Nowak, Nowak, Spałek 2000), m. Do i Op, na W od PG, na N od KP, na N od Ch (Nowak, Nowak 2003, Nowak 2005), VU, Sp,  
 178. *Cerastium arvense* L.; 5, (!), common within the area, Ap,  
 179. *Cerastium glomeratum* Thuill.; 2, (!), Ra, MK, Br, Ap,

180. *Cerastium holosteoides* Fr. Em. Hyl.; 5, (!), common within the area, Ap,  
 181. *Cerastium semidecandrum* L.; 3, (!), Br, Op, PG, Lw, Ap,  
 182. *Cerasus avium* (L.) Moench; 2, (!), KP, Le, Co, Lw, Ap,  
 183. *Ceratophyllum demersum* L.; 1, (!), Op, Br, Sp,  
 184. *Chaenorhinum minus* (L.)Lange; 2, (!), Br, Ci, Do, Ap,  
 185. *Chaerophyllum aromaticum* L.; 2, (!), Op, Br, Gr, Ap,  
 186. *Chaerophyllum bulbosum* L.; 1, (!), Br, Do, KP, PG, Ci, Ap,  
 187. *Chaerophyllum hirsutum* L.; 3, (!), Gr, Pi, Op, Ch, Bl, Co, Sp,  
 188. *Chaerophyllum temulum* L.; 2, (!), Op, Pi, Le, PG, Sp,  
 189. *Chamaecytisus supinus* (L.) Link; 1, (!), Pi, Br, Sp,  
 190. *Chamaenerion angustifolium* (L.) Scop.; 5, (!), common within the area, Sp,  
 191. *Chamaenerion palustre* Scop.; 1, (!), Br, Ci, Ap,  
 192. \* *Chamomilla recutita* (L.) Rauschert; 4, (!), frequent within the area, Arch,  
 193. \* *Chamomilla suaveolens* (Pursh) Rydb.; 4, (!), frequent within the area, K,  
 194. *Chelidonium majus* L.; 5, (!), common within the area, Ap,  
 195. *Chenopodium album* L.; 5, (!), common within the area, Ap,  
 196. \* *Chenopodium bonus-henricus* L.; 3, (!), Pi, Zu, Zo, Ci, Do, Mo, Arch,  
 197. *Chenopodium glaucum* L.; 2, (!), Mo, Op, PG, Lw, Ap,  
 198. \* *Chenopodium hybridum* L.; 2, (!), Op, Do, Ci, Bl, Arch,  
 199. *Chenopodium polyspermum* L.; 1, (!), Bl, Ap,  
 200. *Chenopodium rubrum* L.; 1, (!), Op, Le, Ap,  
 201. \* *Chenopodium urbicum* L.; 2, (!), PG, Mo, Zo, Arch,  
 202. \* *Chenopodium vulvaria* L.; 2, (!), PG, KP, Ch, Bl, Arch,  
 203. *Chrysosplenium alternifolium* L.; 4, (!), frequent within the area, Sp,  
 204. *Cichorium intybus* L.; 4, (!), frequent within the area, Arch,  
 205. *Circaea alpina* L.; 1, (!), Op, Pi, NT, Sp,  
 206. *Circaea intermedia* Ehrh.; 1, (!), Gr, NT, Sp,  
 207. *Circaea lutetiana* L.; 3, (!), Gr, Op, Pi, Br, Lw, Ch, Sp,  
 208. *Cirsium arvense* (L.) Scop.; 5, (!), common within the area, Ap,  
 209. *Cirsium canum* (L.) All.; 2, (!), VU, Ch, PG, Ra, Bl, Sp,  
 210. *Cirsium oleraceum* (L.) Scop.; 3, (!), Ra, MK, Bl, Pi, Op, Sp,  
 211. *Cirsium palustre* (L.) Scop.; 2, (!), Op, Pi, Bl, Sp,  
 212. *Cirsium rivulare* (Jacq.) All.; 3, (!), Op, Pi, MK, Mo, Bl, Sp,  
 213. \* *Cirsium vulgare* (Savi) Ten.; 3, (!), Pi, Do, KP, PG, Zu, Le, Arch,  
 214. *Clinopodium vulgare* L.; 2, (!), Pi, Ch, Br, Sp,  
 215. *Coeloglossum viride* (L.) Hartm.; 1, Zu (Schube 1903), RE, Sp,  
 216. *Colchicum autumnale* L.; 2, (!), Pi, KP (Dajdok et al. 1998a), LC, Sp,  
 217. \*\* *Consolida ajacis* (L.) Schur; 1, (!), Do, Op, Dia,  
 218. \* *Consolida regalis* Gray; 3, (!), Op, PG, KP, Ci, Le, Lw, Arch,  
 219. *Convallaria majalis* L.; 5, (!), common within the area, Sp,  
 220. *Convolvulus arvensis* L.; 5, (!), common within the area, Arch,  
 221. \* *Conyza canadensis* (L.) Cronquist; 5, (!), common within the area, K,

222. *Corallorhiza trifida* Châtel.; 1, Br (Wimmer 1844, Fiek 1881, Schube 1903), CR, Sp,
223. *Cornus sanguinea* L.; 3, (!), Op, KP, Ch, Br, Ci, Lw, Sp,
224. *Coronilla varia* L.; 3, (!), Pi, Op, Br, Ch, Ci, Co, Lw, Ap,
225. *Corydalis cava* Schweigg. & Körte; 2, (!), Gr, Br, Sp,
226. *Corydalis intermedia* (L.) Mérat; 1, (!), Gr, VU, Sp,
227. *Corydalis solida* (L.) Clairv.; 1, (!), NT, Gr, Br, Sp,
228. *Corylus avellana* L.; 4, (!), frequent within the area, Sp,
229. *Corynephorus canescens* (L.) P. Beauv.; 1, (!), Br, Ci, Sp,
230. *Crataegus laevigata* (Poir.) DC.; 3, (!), Op, Pi, Gr, Br, Lw, Co, Sp,
231. *Crataegus monogyna* Jacq.; 4, (!), Op, Le, Zu, Br, Ci, Co, Pi, Sp,
232. *Crepis biennis* L.; 3, (!), Pi, Op, Br, MK, PG, KP, Bl, Ap,
233. *Crepis paludosa* (L.) Moench; 2, (!), KP, Op, Bl, Sp,
234. *Crepis tectorum* L.; 2, (!), KP, Bl, Pi, Br, Ap,
235. *Cruciata glabra* (L.) Ehrend.; 4, (!), frequent within the area, Ap,
236. *Cruciata laevipes* Opiz; 1, (!), VU, Br, Ap,
237. *Cucubalus baccifer* L.; 2, (!), Op, Zu, Zo, Ap,
238. *Cuscuta europaea* L.; 2, (!), Op, Pi, LC, Sp,
239. \* *Cymbalaria muralis* P. Gaertn., B Mey. & Scherb.; 1, (!), KP, K,
240. *Cynoglossum officinale* L.; 1, (!), Ra, CR, Ap,
241. *Cynosurus cristatus* L.; 2, (!), Co, Op, Br, Sp,
242. *Cystopteris fragilis* (L.) Bernh.; 2, (!), Ch, Pi, Br, NT, Ap,
243. *Dactylis glomerata* L. subsp. *glomerata*; 5, (!), Pi, Co, Ch, Ra, Op, KP, PG, Ci, Br, Do, Ap,
244. *Dactylis polygama* Horv.; 2, (!), Pi, Br, Sp,
245. *Dactylorhiza majalis* (Rchb.) P. H. Hunt & Summerh.; 1, (!), Pielgrzymów (Dajdok et al. 1998a), between Op and Pi (Nowak, Nowak, Spałek 2000), KM, to the N from Do (Nowak, Nowak 2003), NT, Sp,
246. *Dactylorhiza sambucina* (L.) Soó; 2, (!), Do (Schube 1915, Nowak, Nowak 2004b), PG (Schalow 1931), Lw (Schube 1914), Pi (Nowak, Nowak 1999), between Op and Pi (Nowak, Nowak 2002), CR, Sp,
247. *Danthonia decumbens* DC.; 2, (!), KP, Op, Br, Sp,
248. *Daphne mezereum* L.; 2, (!), to the NW from Ra (Nowak, Nowak, Spałek 2000), between Do and Op, KP (Nowak, Nowak 2003), Pi, Br, LC, Sp,
249. \* *Datura stramonium* L.; 1, (!), Ch, K,
250. *Daucus carota* L.; 5, (!), common within the area, Ap,
251. *Dentaria bulbifera* L.; 2, (!), Br, Do, LC, Sp,
252. *Deschampsia caespitosa* (L.) P. Beauv.; 2, (!), Do, Op, KP, Sp,
253. *Deschampsia flexuosa* (L.) Trin.; 4, (!), cały obszar, Sp,
254. \* *Descurainia sophia* (L.) Webb ex Prantl; 4, (!), pola na całym obszarze, Arch,
255. *Dianthus carthusianorum* L.; 2, (!), Op, Lw, Br, NT, Sp,
256. *Dianthus deltoides* L.; 4, (!), frequent within the area, LC, Sp,

257. *Digitalis grandiflora* Mill.; 2, (!), Grodzie (Celiński et al. 1974-75), Pi, Do, KP, Ch, VU, Sp,
258. \* *Digitalis purpurea* L.; 2, (!), Br, LC, K,
259. \* *Digitaria ischaemum* (Schreb.) H. L. Mühl.; 2, (!), KP, Op, Zu, Do, Arch,
260. \* *Diploaxis muralis* (L.) DC.; 2, (!), Op, KP, Ch, PG, Co, K,
261. *Dipsacus sylvestris* Huds.; 2, (!), Op, Co, PG, Ap,
262. *Drosera rotundifolia* L.; 1, Br (Schube 1930), LC, Sp,
263. *Dryopteris carthusiana* (Vill.) H. P. Fuchs; 3, (!), frequent in woods, Sp,
264. *Dryopteris dilatata* (Hoffm.) A. Gray; 1, (!), Pi, Op, DD, Sp,
265. *Dryopteris filix-mas* (L.) Schott; 5, (!), frequent within the area, Sp,
266. \* *Echinochloa crus-galli* (L.) P. Beauv.; 5, (!), frequent within the area, Arch,
267. \* *Echinops sphaerocephalus* L.; 1, (!), PG, K,
268. *Echium vulgare* L.; 3, (!), Op, KP, Le, Ra, Br, Ci, Ch, Lw, Ap,
269. *Eleocharis acicularis* (L.) Roem. & Schult.; 1, (!), KP, Sp,
270. *Eleocharis palustris* (L.) Roem. & Schult.; 2, (!), Op, KP, Ch, Sp,
271. \* *Elodea canadensis* Michx.; 1, (!), Op, Br, K,
272. *Elymus caninus* (L.) L.; 1, (!), Pi, Sp,
273. *Elymus repens* (L.) Gould; 5, (!), common within the area, Ap,
274. \* *Epilobium ciliatum* Raf.; 1, (!), Op, K,
275. *Epilobium collinum* C. C. Gmel.; 2, (!), Op, KP, Do, Br, Zo, Sp,
276. *Epilobium hirsutum* L.; 2, (!), Op, Le, Ch, Br, Ap,
277. *Epilobium montanum* L.; 2, (!), Pi, Do, Ra, Sp,
278. *Epilobium palustre* L.; 2, (!), Op, Do, Br, Zo, Sp,
279. *Epilobium parviflorum* Schreb.; 1, (!), KP, Le, Lw, Sp,
280. *Epilobium roseum* Schreb.; 1, (!), Bl, Sp,
281. *Epipactis helleborine* (L.) Crantz; 1, (!), Op, Do; LC, Sp,
282. *Equisetum arvense* L.; 5, (!), common within the area, Ap,
283. *Equisetum fluviatile* L.; 1, (!), Op, Bl, Sp,
284. *Equisetum pratense* Ehrh.; 2, (!), KP, Le, PG, Sp,
285. *Equisetum ramosissimum* Desf. ; 1, (!), Bl (Schube 1903), EN, Sp,
286. *Equisetum sylvaticum* L.; 4, (!), Op, Do, Pi, Ra, Br, Co, Ch, Sp,
287. \* *Eragrostis minor* Host; 1, (!), PG, Op, K,
288. *Erigeron acris* L.; 4, (!), Op, Do, Br, KP, PG, Ci, Co, Ap,
289. *Erigeron annuus* (L.) Pers.; 4, (!), frequent within the area, K,
290. *Eriophorum angustifolium* Honck.; 1, (!), Pi, Sp,
291. *Erodium cicutarium* (L.) L 'Hér.; 3, (!), Op, KP, Le, Lw, Br, Ap,
292. *Erophila verna* (L.) Chevall.; 4, (!), frequent within the area, Ap,
293. \* *Erysimum cheiranthoides* L.; 5, (!), common within the area, Ap,
294. *Euonymus europea* L.; 2, (!), Pi, Op, Ra, Co, PG, Sp,
295. *Eupatorium cannabinum* L.; 2, (!), Op, KP, Le, Bl, Ap,
296. *Euphorbia cyparissias* L.; 5, (!), common within the area, Ap,
297. *Euphorbia dulcis* L.; 2, (!), Pi, Op, Ch, Ra, Ch, Sp,

298. *Euphorbia esula* L.; 1, (!), KP, Do, Ap,  
 299. \* *Euphorbia helioscopia* L.; 4, (!), frequent within the area, Arch,  
 300. \* *Euphorbia peplus* L.; 1, (!), KP, Mo, Arch,  
 301. *Euphrasia rostkovaina* Hayne; 3, (!), PG, Co, Op, KP, Pi, Sp,  
 302. *Euphrasia stricta* D. Wolff ex J. F. Lehm.; 1, (!), Pi, KP, Sp,  
 303. \*\* *Fagopyrum esculentum* Moench; 1, (!), Le, Dia,  
 304. *Fagus sylvatica* L.; 3, (!), Pi, Ra, PG, KP, Bl, Zo, Do, Sp,  
 305. \* *Fallopia convolvulus* (L.) Á. Löve; 4, (!), frequent within the area, Arch,  
 306. *Fallopia dumetorum* (L.) Holub; 1, (!), Op, Le, Ch, Ap,  
 307. *Festuca altissima* All.; 2, (!), Op, Pi, Ra, Sp,  
 308. *Festuca arundinacea* Schreb.; 2, (!), Op, Pi, Ra, PG, Ap,  
 309. *Festuca gigantea* (L.) Vill.; 1, (!), Op, Pi, Sp,  
 310. *Festuca ovina* L.; 4, (!), frequent within the area, Ap,  
 311. *Festuca pratensis* Huds.; 3, (!), KP, Op, Do. Co, Ci, Br, Sp,  
 312. *Festuca rubra* L.; 4, (!), frequent within the area, Sp,  
 313. *Festuca trachyphylla* (Hack.) Krajina; 1, (!), Pi, VU, Ap,  
 314. *Ficaria verna* Huds.; 4, (!), Pi, Op, KP, Le, Ra, Co, Bl, Zo, Mo, Br, Sp,  
 315. *Filago arvensis* L.; 1, (!), Br, Op, Ch, VU, Ap,  
 316. *Filago minima* (Sm.) Pers.; 1, (!), Br, VU, Ap,  
 317. *Filipendula ulmaria* (L.) Maxim.; 2, (!), Op, Le, KP, Bl, Pi, Sp,  
 318. *Filipendula vulgaris* Moench; 2, (!), Op, Pi, Do, Co, Br, NT, Sp,  
 319. \*\* *Foeniculum vulgare* Mill.; 1, (!), Le, Mo, Dia,  
 320. *Fragaria moschata* Duchesne; 1, (!), Ra, Op, Sp,  
 321. *Fragaria vesca* L.; 5, (!), common within the area, Ap,  
 322. *Fragaria viridis* Duchesne; 3, (!), Pi, Do, Op, Ra, Ch, Co, KP, PG, Sp,  
 323. *Frangula alnus* Mill.; 3, (!), Pi, Ra, Op, Zo, Br, PG, Sp,  
 324. *Fraxinus excelsior* L.; 5, (!), common within the area, Ap,  
 325. \* *Fumaria officinalis* L.; 5, (!), common within the area, Arch,  
 326. *Gagea lutea* (L.) Ker Gawl.; 3, (!), Pi, Ra, Do, Op, Bl, PG, Ci, Br, Sp,  
 327. *Galanthus nivalis* L.; 2, (!), Op, Ra, Bl, Sp,  
 328. *Galeobdolon luteum* Huds.; 4, (!), frequent within the area, Sp,  
 329. *Galeopsis angustifolia* (Ehrh.) Hoffm.; 1, (!), PG, Ch, Ap,  
 330. *Galeopsis bifida* Boenn.; 2, (!), Ch, Br, Op, Mo, Ap,  
 331. \* *Galeopsis ladanum* L.; 3, (!), Op, Pi, Do, Mo, PG, Ch, Co, KP, Arch,  
 332. *Galeopsis pubescens* Besser; 2, (!), Br, Op, Pi, Ra, Le, Ap,  
 333. *Galeopsis speciosa* Mill.; 3, (!), Do, Pi, Ra, Op, Le, KP, PG, Sp,  
 334. *Galeopsis tetrahit* L.; 4, (!), frequent within the area, Sp,  
 335. \* *Galinsoga ciliata* (Raf.) S. F. Blake; 4, (!), frequent within the area, K,  
 336. \* *Galinsoga parviflora* Cav.; 5, (!), common within the area, K,  
 337. *Galium aparine* L.; 5, (!), common within the area, Ap,  
 338. *Galium mollugo* L.; 4, (!), frequent within the area, Sp,  
 339. *Galium odoratum* (L.) Scop; 3, (!), Pi, Op, Ra, KP, Le, Lw, PG, Br, Sp,

340. *Galium palustre* L.; 2, (!), Op, Pi, Br, Sp,  
 341. *Galium rotundifolium* L.; 3, (!), Pi, Do, Op, Ra, PG, KP; VU, Sp,  
 342. *Galium saxatile* L.; 1, (!), Pi, Op, EN, Sp,  
 343. *Galium schultesii* Vest; 3, (!), Pi, DO, Ra, Op, Sp,  
 344. *Galium sylvaticum* L.; 3, (!), Pi, Do, Ra, Ci, Ch, Bl, PG, Sp,  
 345. *Galium uliginosum* L.; 2, (!), Op, Br, Pi, Bl, Sp,  
 346. *Galium verum* L.; 4, (!), frequent within the area, Ap,  
 347. *Genista germanica* L.; 2, (!), Pi, PG, Ch, Op, (Mađalski et al. 1963), LC, Sp,  
 348. *Genista tinctoria* L.; 3, (!), Br, PG, KP, Le, Co, Op, Do, Sp,  
 349. *Gentiana pneumonanthe* L.; 1, Ra (Schube 1903), Lw (Schube 1914), VU, Sp,  
 350. *Gentianella bohemica* Skalický; 1, Braciszów (Huhlberg, Schube 1903), RE, Sp,  
 351. *Geranium columbinum* L.; 2, (!), Op, KP, Ch, Ap,  
 352. \* *Geranium dissectum* L.; 3, (!), Op, Ra, Do, Co, NT, Arch,  
 353. \* *Geranium molle* L.; 1, (!), Pi, Do, Ch, KP, Arch,  
 354. *Geranium palustre* L.; 3, (!), Pi, Op, Bl, Ch, PG, Ra, Br, Sp,  
 355. *Geranium phaeum* L.; 2, (!), Op, KP, Pi, Do, VU, Sp,  
 356. *Geranium pratense* L.; 2, (!), Ra, Ch, KP, Bl, Sp,  
 357. \* *Geranium pusillum* Burn. F. ex L.; 3, (!), Op, KP, Le, Lw, Do, Ra, Br, Arch,  
 358. \* *Geranium pyrenaicum* Burm. f.; 3, (!), Op, KP, PG, Le, Do, Ra, Mo, K,  
 359. *Geranium robertianum* L.; 4, (!), frequent within the area, Ap,  
 360. *Geranium sylvaticum* L.; 1, (!), Ci (ATPOL), Bl, Sp,  
 361. *Geum rivale* L.; 3, (!), Ra, Mo, KP, PG, Sp,  
 362. *Geum urbanum* L.; 4, (!), frequent within the area, Ap,  
 363. *Gladiolus imbricatus* L.; 1, Grodzie (Fiek 1881, Schube 1903), CR, Sp,  
 364. *Glechoma hederacea* L.; 5, (!), common within the area, Sp,  
 365. *Glyceria fluitans* (L.) R. Br.; 1, (!), Op, Bl, Sp,  
 366. *Glyceria maxima* (Hartm.) Holmb.; 2, (!), Op, Le, Bl, KP, Ch, Sp,  
 367. *Glyceria plicata* Fr.; 1, (!), Le, Sp,  
 368. *Gnaphalium sylvaticum* L.; 3, (!), Pi, Ra, Do, PG, Lw, Ap,  
 369. *Gnaphalium uliginosum* L.; 2, (!), Ra, Op, Pi, Bl, Br, Ap,  
 370. *Gymnocarpium dryopteris* (L.) Newman; 1, (!), Br, Sp,  
 371. *Gypsophila muralis* L.; 2, (!), Br, Op, KP, Ch, Ap,  
 372. *Hedera helix* L.; 4, (!), frequent within the area, Mo (Mađalski et al. 1963), Pi (Dajdok et al. 1998a), Ap,  
 373. *Helianthemum nummularium* (L.) Mill.; 2, (!), Op, Pi, KP, Ch, PG, Sp,  
 374. \* *Helianthus tuberosus* L.; 2, (!), PG, Ch, Zo, Mo, K,  
 375. *Hepatica nobilis* Schreb.; 2, (!), Ra, Lw, Co, Op, LC, Sp,  
 376. \* *Heracleum sosnovskyi* Manden.; 1, (!), PG, K,  
 377. *Heracleum sphondylium* L.; 4, (!), frequent within the area, Ap,  
 378. *Herniaria glabra* L.; 2, (!), KP, Ch, Op, Br, Ch, Ap,  
 379. *Hieracium bauginii* Schult.; 1, (!), Op, Pi, Co, Ap,  
 380. *Hieracium caespitosum* Dumort.; 1, (!), PG, Sp,

381. *Hieracium floribundum* Wimm. & Grab.; 1, (!), Pi, Sp,  
 382. *Hieracium lachenalii* C. C. Gmel.; 3, (!), Pi, Do, Ra, Op, Sp,  
 383. *Hieracium laevigatum* Willd.; 2, (!), Do, Op, Ch, Sp,  
 384. *Hieracium murorum* L.; 4, (!), frequent within the area, Ap,  
 385. *Hieracium pilosella* L.; 2, (!), KP, Ch, Br, Co, Ap,  
 386. *Hieracium piloselloides* Vill.; 2, (!), KP, Op, Pi, Co, PG, Ap,  
 387. *Hieracium sabaudum* L.; 2, (!), PG, Mo, Do, Sp,  
 388. *Hieracium umbellatum* L.; 3, (!), PG, KP, Le, Lw, Br, Ch, Op, Sp,  
 389. *Holcus lanatus* L.; 4, (!), frequent within the area, Sp,  
 390. *Holcus mollis* L.; 4, (!), frequent within the area, Ap,  
 391. *Holosteum umbellatum* L.; 4, (!), frequent within the area, Ap,  
 392. \* *Hordeum murinum* L.; 1, (!), Br, Op, Arch,  
 393. *Humulus lupulus* L.; 2, (!), Op, Pi, Ci, Bl, PG, Sp,  
 394. *Hydrocharis morsus-ranae* L.; 1, (!), Br, Sp,  
 395. *Hydrocotyle vulgaris* L.; 2, (!), Ra, KM, Pi, Sp,  
 396. \* *Hyoscyamus niger* L.; 1, (!), Do, Op, VU, Arch,  
 397. *Hypericum hirsutum* L.; 1, (!), KP; VU, Sp,  
 398. *Hypericum maculatum* Crantz; 3, (!), Op, Pi, Ra, Do, Ci, SAp,  
 399. *Hypericum montanum* L.; 1, (!), PG; EN, Sp,  
 400. *Hypericum perforatum* L.; 5, (!), common within the area, Ap,  
 401. *Hypochoeris maculata* L.; 1, Lw (Schube 1914), Mo (Schube 1913), EN, Sp,  
 402. *Hypochoeris radicata* L.; 4, (!), frequent within the area, Sp,  
 403. \* *Impatiens glandulifera* Royle; 2, (!), Op, Le, KP, Ch, Bl, K,  
 404. *Impatiens noli-tangere* L.; 4, (!), frequent within the area, Sp,  
 405. \* *Impatiens parviflora* DC.; 5, (!), common within the area, K,  
 406. *Inula britannica* L.; 1, (!), Ch, Ra, Sp,  
 407. *Inula conyza* DC.; 1, (!), Op (Schube 1903), Ch, EN, Ap,  
 408. *Inula salicina* L.; 1, (!), Br, NT, Sp,  
 409. *Iris pseudacorus* L.; 1, (!), Op, Ra, Sp,  
 410. *Isopyrum thalictroides* L.; 1, (!), Ra, LC, Sp,  
 411. *Jasione montana* L.; 1, (!), Br, Ch, Ap,  
 412. *Jovibarba sobolifera* (Sims) Opiz; 1, PG (Schube 1914), CR, Sp,  
 413. *Juncus articulatus* L. em. K. Richt.; 1, (!), Op, Ra, Br, Ap,  
 414. *Juncus bufonius* L.; 4, (!), frequent within the area, Ap,  
 415. *Juncus conglomeratus* L. em. Leers; 3, (!), Op, Pi, Do, MK, Ra, Sp,  
 416. *Juncus compressus* Jacq.; 1, (!), Op, Ra, Sp,  
 417. *Juncus effusus* L.; 3, (!), Op, Pi, Br, B, Ch, Zo, Mo, Sp,  
 418. *Juncus inflexus* L.; 2, (!), Op, Mo, Ra, Sp,  
 419. \* *Juncus tenuis* Willd.; 4, (!), frequent within the area, K,  
 420. *Juniperus communis* L.; 1, (!), Co, Ch, Sp,  
 421. *Knautia arvensis* (L.) J. M. Coult.; 4, (!), frequent within the area, Ap,  
 422. *Koeleria pyramidata* (Lam.) P. Beauv.; 1, (!), PG, Ch, Sp,

423. \* *Lactuca serriola* L.; 4, (!), frequent within the area, Arch,  
 424. \* *Lamium album* L.; 3, (!), Pi, Op, PG, Bl, Le, Ra, Arch,  
 425. \* *Lamium amplexicaule* L.; 4, (!), frequent within the area, Arch,  
 426. *Lamium maculatum* L.; 5, (!), common within the area, Ap,  
 427. \* *Lamium purpureum* L.; 5, (!), common within the area, Arch,  
 428. *Lapsana communis* L.; 3, (!), Op, Ra, Do, KP, PG, Zo, Mo, Ap,  
 429. *Larix decidua* Mill.; 5, (!), common within the area, Sp,  
 430. *Laserpitium prutenicum* L.; 1, VU, Sp,  
 431. *Lathraea squamaria* L.; 1, (!), Pi, Op, Br (Dajdok et al. 1998b), Sp,  
 432. *Lathyrus niger* (L.) Bernh.; 1, (!), Pi, Op, Ch, Sp,  
 433. *Lathyrus pratensis* L.; 3, (!), Op, Pi, KP, Ch, Ra, Sp,  
 434. *Lathyrus sylvestris* L.; 1, (!), Pi, KP, Sp,  
 435. *Lathyrus vernus* (L.) Bernh.; 4, (!), frequent within the area, Sp,  
 436. *Lembotropis nigricans* (L.) Griseb.; 2, (!), LP, CH, Co, NT, Sp,  
 437. *Lemna minor* L.; 2, (!), Op, Br, Le, Sp,  
 438. *Lemna trisulca* L.; , (!), Op, KP, Sp,  
 439. *Leontodon autumnalis* L.; 4, (!), frequent within the area, Ap,  
 440. *Leontodon hispidus* L.; 4, (!), frequent within the area, Ap,  
 441. \* *Leonurus cardiaca* L.; 1, (!), Ch, Arch,  
 442. \* *Lepidium campestre* (L.) R. Br.; 4, (!), frequent within the area, Arch,  
 443. \* *Lepidium densiflorum* Schrad.; 2, (!), Co, Ci, Le, Do, K,  
 444. \* *Lepidium ruderales* L.; 5, (!), common within the area, Arch,  
 445. *Leucanthemum vulgare* Lam.; 4, (!), frequent within the area, Ap,  
 446. *Ligustrum vulgare* L.; 2, (!), KP, Op, Ch, Co, K,  
 447. *Lilium martagon* L.; 2, (!), Co (Nowak, Nowak 2003), na E od Op (Nowak 2005),  
 Ch, KP, Do, Pi, Sp,  
 448. *Linaria vulgaris* (L.) Mill.; 3, (!), KP, Ch, Br, Co, Zu, Sp,  
 449. *Linum catharticum* L.; 1, (!), Br, Co, Ap,  
 450. \*\* *Linum usitatissimum* L.; 1, (!), MK, Dia,  
 451. *Listera ovata* (L.) R. Br.; 2, (!), Pi, Do, Ra, Bl, NT, Sp,  
 452. \* *Lithospermum arvense* L.; 3, (!), Do, Ra, Op, KP, PG, Lw, Zu, Arch,  
 453. *Lolium perenne* L.; 5, (!), common within the area, Ap,  
 454. \* *Lolium temulentum* L.; 1, (!), Ra, Do, Arch,  
 455. \* *Lonicera nigra* L.; 1, (!), Ra, KP, Dia,  
 456. *Lonicera xylosteum* L.; 3, (!), Pi, Do, KP, Ch, Ra, Br, Sp,  
 457. *Lotus corniculatus* L.; 5, (!), common within the area, Ap,  
 458. *Lotus tenuis* Waldst. & Kit. ex Willd.; 1, (!), Br, Ap,  
 459. *Lotus uliginosus* Schkuhr; 2, (!), Op, Ra, MK, Sp,  
 460. \* *Lupinus polyphyllus* Lindl.; 2, (!), Op, Ch, PG, MK, K,  
 461. *Luzula campestris* (L.) DC.; 4, (!), frequent within the area, Ap,  
 462. *Luzula luzuloides* (Lam.) Dandy & Willmott; 3, (!), Pi, Do, Ra, Op, KP, PG; NT, Sp,  
 463. *Luzula multiflora* (Retz.) Lej.; 4, (!), frequent within the area, Ap,



464. *Luzula pilosa* (L.) Willd.; 3, (!), Pi, Ch, Co, KP, Op, Do, Ra, Sp,  
 465. *Lychnis flos-cuculi* L.; 4, (!), frequent within the area, Sp,  
 466. \* *Lycium barbarum* L.; 1, (!), PG, K,  
 467. *Lycopus europaeus* L.; 1, (!), Op, Bl, Sp,  
 468. *Lysimachia nemorum* L.; 2, (!), Pi, Op, Do, EN, Sp,  
 469. *Lysimachia nummularia* L.; 4, (!), frequent within the area, Sp,  
 470. *Lysimachia vulgaris* L.; 3, (!), Pi, Ra, PG, Bl, Op, Sp,  
 471. *Lythrum salicaria* L.; 3, (!), Ra, MK, Br, Pi, Bl, Zu, Sp,  
 472. *Maianthemum bifolium* (L.) F. W. Schmidt; 4, (!), frequent within the area, Sp,  
 473. *Malus sylvestris* Mill.; 3, (!), Op, Ra, Gr, Ci, Le, Ap,  
 474. \* *Malva alcea* L.; 4, (!), frequent within the area, K,  
 475. \* *Malva crispa* L.; 1, (!), KP, Le, Arch,  
 476. \* *Malva moschata* L.; 4, (!), frequent within the area, Arch,  
 477. \* *Malva neglecta* Wallr.; 4, (!), frequent within the area, Arch,  
 478. \* *Matricaria maritima* L.; 5, (!), common within the area, Arch,  
 479. *Medicago falcata* L.; 3, (!), Do, Co, KP, Ch, Op, Br, Sp,  
 480. *Medicago lupulina* L.; 5, (!), common within the area, Ap,  
 481. \* *Medicago sativa* L.; 5, (!), common within the area, K,  
 482. *Melampyrum nemorosum* L.; 4, (!), frequent within the area, Sp,  
 483. *Melampyrum pratense* L.; 4, (!), frequent within the area, Sp,  
 484. \* *Melandrium album* (Mill.) Garcke; 4, (!), frequent within the area, Arch,  
 485. \* *Melandrium noctiflorum* (L.) Fr.; 1, (!), PG; NT, Arch,  
 486. *Melandrium rubrum* (Weigel) Garcke; 2, (!), Ra, Bl, Op, Sp,  
 487. *Melica nutans* L.; 2, (!), Ra, Bl, Br, Sp,  
 488. *Melica uniflora* Retz.; 1, (!), Gr, NT, Sp,  
 489. *Melilotus alba* Medik.; 3, (!), Op, MK, Br, Zu, Zo, Co, PG, Ap,  
 490. *Melilotus officinalis* (L.) Pall.; 4, (!), frequent within the area, Ap,  
 491. *Melittis melissophyllum* L.; 1, (!), Lw (Schube 1914), to the SE from Co (Nowak,  
 Nowak 2003), VU, Sp,  
 492. *Mentha aquatica* L.; 2, (!), Op, Pi, Ra, MK, Bl, Sp,  
 493. *Mentha arvensis* L.; 4, (!), frequent within the area, Ap,  
 494. *Mentha longifolia* (L.) L.; 2, (!), Op, KP, PG, Bl, Sp,  
 495. *Mentha x verticillata* L.; 2, (!), Op, Bl, Sp,  
 496. \* *Mercurialis annua* L.; 1, (!), Br, K,  
 497. *Mercurialis perennis* L.; 3, (!), Op, Pi, Ra, Br, Sp,  
 498. *Milium effusum* L.; 4, (!), Pi, Do, Ra, Op, Co, Zu, Br, Sp,  
 499. *Moehringia trinervia* (L.) Clairv.; 5, (!), common within the area, Sp,  
 500. *Molinia coerulea* (L.) Moench; 3, (!), Pi, Op, Ra, MK, Bl, Sp,  
 501. *Moneses uniflora* (L.) A. Gray; 1, Bl (Schube 1903), DD, Sp,  
 502. *Mycelis muralis* (L.) Dumort.; 4, (!), frequent within the area, Ap,  
 503. \* *Myosotis arvensis* (L.) Hill; 5, (!), common within the area, Arch,  
 504. *Myosotis palustris* (L.) L. em Rchb.; 4, (!), frequent within the area, Sp,

505. *Myosotis stricta* Link ex Roem. & Schult.; 3, (!), Pi, Op, KP, Le, Ch, Br, Lw, Co, Ap,
506. *Myosotis sylvatica* Ehrh. ex Hoffm.; 4, (!), frequent within the area, Sp,
507. *Myosoton aquaticum* (L.) Moench; 2, (!), Op, KP, Le, Bl, Sp,
508. *Nardus stricta* L.; 3, (!), Op, Do, Ra, Co, PG, Sp,
509. *Neottia nidus-avis* (L.) Rich.; 1, (!), Ra, VU, Sp,
510. \* *Neslia paniculata* (L.) Desv.; 2, (!), Op, KP, PG, Zu, Mo, Arch,
511. *Odontites serotina* (Lam.) Rchb.; 2, (!), Mo, Pi, Op, Ci, Ap,
512. *Oenanthe aquatica* (L.) Poir.; 2, (!), Op, Bl, MK, Sp,
513. *Oenothera biennis* L.; 4, (!), frequent within the area, Sp,
514. *Ononis arvensis* L.; 1, (!), KP, Sp,
515. *Orchis mascula* (L.) L. subsp. *signifera* (Vest) Soó; 1, (!), to the W from Do (Nowak, Nowak 2003), CR, Sp,
516. *Orthilia secunda* (L.) House; 1, (!), Ch, LC, Sp,
517. *Oxalis acetosella* L.; 5, (!), common within the area, Sp,
518. \* *Oxalis fontana* Bunge; 4, (!), frequent within the area, K,
519. *Padus avium* Mill.; 4, (!), frequent within the area, Sp,
520. \* *Padus serotina* (Ehrh.) Borkh.; 4, (!), frequent within the area, K,
521. \* *Papaver argemone* L.; 2, (!), Ci, Zu, Mo, Arch,
522. \* *Papaver dubium* L.; 1, (!), Ci, Arch,
523. \* *Papaver rhoeas* L.; 4, (!), frequent within the area, Arch,
524. *Paris quadrifolia* L.; 4, (!), frequent within the area, Sp,
525. *Pastinaca sativa* L.; 4, (!), frequent within the area, Ap,
526. *Petasites albus* (L.) Gaertn.; 2, (!), Pi, Op, PG, Bl, LC, Sp,
527. *Petasites hybridus* (L.) Gaertn., B. Mey. & Scherb.; 3, (!), Pi (Dajdok i in 1998b), KP, Op, Le, Bl, LC, Sp,
528. *Peucedanum cervaria* (L.) Lapeyr.; 2, (!), Co, Do, Op, KP, PG, Br, Sp,
529. *Peucedanum oreoselinum* (L.) Moench; 4, (!), frequent within the area, Sp,
530. *Peucedanum palustre* (L.) Moench; 2, (!), Op, Ra, Bl, Sp,
531. *Phalaris arundinacea* L.; 3, (!), Op, Ra, Le, KP, PG, Ch, Bl, Br, Sp,
532. *Phegopteris connectilis* (Michx.) Watt; 2, (!), Op, Pi, Br, Sp,
533. *Phleum phleoides* (L.) H. Karst.; 1, (!), Ch, Sp,
534. *Phleum pratense* L.; 4, (!), frequent within the area, Sp,
535. *Phragmites australis* (Cav.) Trin. ex Steud.; 4, (!), frequent within the area, Sp,
536. *Phyteuma orbiculare* L.; 1, Co (Fiek 1881, Schube 1903), RE, Sp,
537. *Phyteuma spicatum* L.; 4, (!), frequent within the area, Sp,
538. *Picea abies* (L.) H. Karst.; 5, (!), common within the area, Sp,
539. *Picris hieracioides* L.; 2, (!), Op, Lw, KP, PG, Ap,
540. *Pimpinella saxifraga* L.; 2, (!), Op, KP, Ch, Lw, Ap,
541. *Pinguicula vulgaris* L. subsp. *vulgaris*; 1, Do (Żukowski 1966), RE, Sp,
542. \* *Pinus strobus* L.; 2, (!), Pi, Op, KP, Br, K,
543. *Pinus sylvestris* L.; 5, (!), common within the area, Sp,

544. *Plantago lanceolata* L.; 4, (!), frequent within the area, Ap,  
 545. *Plantago major* L.; 5, (!), common within the area, Ap,  
 546. *Plantago media* L.; 3, (!), Pi, Op, Ch, Lw, Sp,  
 547. *Platanthera bifolia* (L.) Rich.; 2, (!), Do (Sendek 1965), Pi (Dajdok et al. 1998a), Br  
 (Nowak, Nowak 2003), na NE od Op, na SW od Do (Nowak, Nowak, Spałek  
 2000), KP; NT, Sp,  
 548. *Poa annua* L.; 5, (!), common within the area, Ap,  
 549. *Poa nemoralis* L.; 5, (!), common within the area, Sp,  
 550. *Poa palustris* L.; 2, (!), Op, Ra, Sp,  
 551. *Poa pratensis* L.; 5, (!), common within the area, Sp,  
 552. *Poa trivialis* L.; 5, (!), common within the area, Sp,  
 553. *Polygala comosa* Schkuhr; 4, (!), frequent within the area, Sp,  
 554. *Polygala vulgaris* L.; 4 (!), frequent within the area, Sp,  
 555. *Polygonatum multiflorum* (L.) All.; 4, (!), frequent within the area, Sp,  
 556. *Polygonatum odoratum* (Mill.) Druce; 4, (!), frequent within the area, Sp,  
 557. *Polygonum amphibium* L.; 2, (!), Op, KP, Ch, Ap,  
 558. *Polygonum aviculare* L.; 5, (!), frequent within the area, Ap,  
 559. *Polygonum bistorta* L.; 1, (!), Ra, MK, Sp,  
 560. *Polygonum hydropiper* L.; 2, (!), Op, Bl, Le, Ap,  
 561. *Polygonum lapathifolium* L. ssp. *lapathifolium*; 2, (!), Op, Do, Mo, Br, Ap,  
 562. *Polygonum persicaria* L.; 4, (!), frequent within the area, Ap,  
 563. *Polypodium vulgare* L. ; 4, (!), frequent within the area, e.g. Do (Sendek 1965), Pi  
 (Dajdok et al. 1998a), LC, Sp,  
 564. *Populus alba* L.; 2, (!), Op, Bl, Ch, Mo, Ap,  
 565. *Populus nigra* L.; 1, (!), PG, Bl, Sp,  
 566. *Populus tremula* L.; 5, (!), common within the area, Ap,  
 567. *Potamogeton natans* L.; 1, (!), Bl, Sp,  
 568. *Potentilla anserina* L.; 4, (!), frequent within the area, Ap,  
 569. *Potentilla argentea* L.; 5, (!), common within the area, Ap,  
 570. *Potentilla erecta* (L.) Raeusch; 3, (!), Ra, Op, Br, Ap,  
 571. *Potentilla heptaphylla* L.; 4, (!), frequent within the area, Sp,  
 572. *Potentilla neumanniana* Rchb.; 4, (!), frequent within the area, Sp,  
 573. *Potentilla recta* L.; 1, (!), to the NE from Op (Nowak, Nowak 2003), EN, Sp,  
 574. *Potentilla reptans* L.; 4, (!), frequent within the area, Sp,  
 575. *Potentilla supina* L.; 1, (!), Op, Ra, VU, Ap,  
 576. *Prenanthes purpurea* L.; 2, (!), Op, Pi, Do, NT, Sp,  
 577. *Primula elatior* (L.) Hill; 3, (!), Pi, Op, Ra, Lw, PG, Br, LC, Sp,  
 578. *Primula veris* L.; 1, (!), Ch (Schube 1915), PG; NT, Sp,  
 579. *Prunella vulgaris* L.; 5, (!), common within the area, Ap,  
 580. *Prunus spinosa* L.; 3, (!), Op, Pi, Le, Lw, KP, PG, Ch, Br, Ap,  
 581. \* *Pseudotsuga menziesii* (Mirb.) Franco; 2, (!), Do, Gr, Op, Br  
 582. *Pteridium aquilinum* (L.) Kuhn; 5, (!), common within the area, Sp,

583. *Pulmonaria angustifolia* L.; 1, Lw, Co (Schube 1903); EN, Sp,  
 584. *Pulmonaria officinalis* L.; 4, (!), frequent within the area, Sp,  
 585. *Pyrola minor* L.; 1, (!), Ch (Nowak 2005), VU, Sp,  
 586. *Pyrola rotundifolia* L.; 1, (!), Ch, Sp,  
 587. *Pyrus pyraster* Burgsd.; 2, (!), Op, Gr, Mo, Zu, Ap,  
 588. *Quercus petraea* (Matt.) Liebl.; 5, (!), common within the area, Sp,  
 589. *Quercus robur* L.; 4, (!), frequent within the area, Sp,  
 590. *Quercus rubra* L.; 2, (!), PG, Br, KP, Ci, K,  
 591. *Ranunculus acris* L.; 5, (!), common within the area, Sp,  
 592. *Ranunculus auricomus* L.; 4, (!), frequent within the area, Sp,  
 593. *Ranunculus bulbosus* L.; 2, (!), Op, Pi, PG, Sp,  
 594. *Ranunculus cassubicus* L. s. l.; 1, (!), Ra, Br, Op, VU, Sp,  
 595. *Ranunculus flammula* L.; 3, (!), Op, Pi, Ra, Br, Bl, Sp,  
 596. *Ranunculus lanuginosus* L.; 4, (!), frequent within the area, Sp,  
 597. *Ranunculus polyanthemos* L.; 4, (!), frequent within the area, Sp,  
 598. *Ranunculus repens* L.; 5, (!), frequent within the area, Ap,  
 599. *Ranunculus sardous* Crantz; 3, (!), Op, Pi, MK, Ci, Br, Ra, NT, Ap,  
 600. *Ranunculus sceleratus* L.; 3, (!), Op, Le, Bl, PG, MK, Pi, Sp,  
 601. \* *Raphanus raphanistrum* L.; 3, (!), Ch, Op, Zu, Zo, Lw, Br, Mo, Arch,  
 602. *Reseda lutea* L.; 2, (!), Op, Do, PG, Ci, Ap,  
 603. \* *Reynoutria japonica* Houtt.; 4, (!), frequent within the area, K,  
 604. *Rhamnus cathartica* L.; 3, (!), Op, Pi, Ch, KP, PG, Co, Sp,  
 605. *Rhinanthus minor* L.; 2, (!), Co, Ch, Pi, Op, Sp,  
 606. *Rhinanthus serotinus* (Schönh.) Oborný; 1, (!), Op, PG, Ap,  
 607. *Ribes spicatum* E. Robson; 1, (!), Op, Ap,  
 608. *Ribes uva-crispa* L.; 2, (!), Ra, Br, Ch, Bl, Ch, Sp,  
 609. \* *Robinia pseudoacacia* L.; 4, (!), frequent within the area, K,  
 610. *Rorippa palustris* (L.) Besser; 3, (!), Zu, Op, KP, CH, Bl, Sp,  
 611. *Rorippa sylvestris* (L.) Besser; 3, (!), Do, Pi, Op, Bl, Br, PG, MK, Ap,  
 612. *Rosa canina* L.; 4, (!), frequent within the area, Ap,  
 613. *Rosa rubiginosa* L.; 1, (!), Do, Sp,  
 614. \* *Rosa rugosa* Thunb.; 1, (!), PG, K,  
 615. *Rubus apricus* Wimm; 1 (ATPOL) , Sp,  
 616. *Rubus caesius* L.; 3, (!), Pi, Op, Br, Co, KP, Ap,  
 617. *Rubus capricollensis* (Sprib.) Sprib.; 1 (ATPOL)  
 618. *Rubus grabowskii* Weihe ex Günther & al.; 1 (ATPOL), Sp,  
 619. *Rubus henrici-egonis* Holub; 1 (ATPOL) , Sp,  
 620. *Rubus hirtus* Waldst. & Kit.; 3, (!), Op, Pi, Do, Br, KP, PG, Bl, Sp,  
 621. *Rubus idaeus* L.; 4, (!), frequent within the area, Sp,  
 622. *Rubus kuleszae* Ziel.; 1 (ATPOL) , Sp,  
 623. *Rubus micans* Godr.; 2 (ATPOL) , Sp,  
 624. *Rubus plicatus* Weihe & Ness; 3, (!), Op, Pi, Br, Co, Ci, KP, Ap,

625. *Rubus posnaniensis* Sprib.; 1 (ATPOL) , Sp,  
 626. *Rubus wimmerianus* (Sprib. Ex Sudre) Sprib.; 1 (ATPOL) , Sp,  
 627. \* *Rudbeckia laciniata* L.; 2, (!), Op, PG, Ch, Zu, K,  
 628. *Rumex acetosa* L.; 4, (!), frequent within the area, Ap,  
 629. *Rumex acetosella* L.; 4, (!), frequent within the area, Ap,  
 630. *Rumex aquaticus* L.; 1, (!), Op, Br, MK, Ap,  
 631. \* *Rumex confertus* Willd.; 2, (!), PG, Bl, MK, K,  
 632. *Rumex conglomeratus* Murray; 3, (!), Pi, Op, PG, Ch, Zu, Sp,  
 633. *Rumex crispus* L.; 4, (!), frequent within the area, Ap,  
 634. *Rumex hydrolapathum* Huds.; 1, (!), Bl, Op, Sp,  
 635. *Rumex maritimus* L.; 1, (!), Op, Bl, NT, Sp,  
 636. *Rumex obtusifolius* L.; 3, (!), Pi, Do, Co, KP, PG, Br, Le, Bl, Sp,  
 637. *Rumex sanguineus* L.; 3, (!), Pi, Do, Ra, Op, Br, Bl, Zu, Zo, Ap,  
 638. \* *Rumex thyrsoiflorus* Fingerh.; 1, (!), Zo, Mo, Ap,  
 639. *Sagina procumbens* L.; 5, (!), common within the area, Sp,  
 640. *Salix alba* L.; 3, (!), Op, Bl, Ch, Le, Sp,  
 641. *Salix aurita* L.; 2, (!), Pi, Op, Br, Bl, Ch, Sp,  
 642. *Salix caprea* L.; 4, (!), frequent within the area, Ap,  
 643. *Salix cinerea* L.; 1, (!), Pi, Br, Sp,  
 644. *Salix fragilis* L.; 4, (!), frequent within the area, Sp,  
 645. *Salix pentandra* L.; 2, (!), Op, Bl, MK, Sp,  
 646. *Salix purpurea* L.; 4, (!), frequent within the area, Sp,  
 647. *Salix triandra* L.; 2, (!), Op, MK, Br, Bl, Sp,  
 648. *Salix viminalis* L.; 4, (!), frequent within the area, Sp,  
 649. *Salvia pratensis* L.; 3, (!), Pi, Do, Op, Le, Lw, KP, PG, NT, Sp,  
 650. *Salvia verticillata* L.; 4, (!), frequent within the area, Sp,  
 651. *Sambucus ebulus* L.; 2, (!), Op, Br, Ch, Ap,  
 652. *Sambucus nigra* L.; 4, (!), frequent within the area, Ap,  
 653. *Sambucus racemosa* L.; 3, (!), Pi, Op, KP, PG, Br, Mo, Gr, Ap,  
 654. *Sanguisorba minor* L.; 1, (!), PG, Sp,  
 655. *Sanguisorba officinalis* L.; 4, (!), frequent within the area, Sp,  
 656. *Sanicula europaea* L.; 3, (!), Pi, Op, Ra, Bl, Lw, KP, PG, Sp,  
 657. *Saponaria officinalis* L.; 2, (!), Op, Ra, PG, Lw, Ap,  
 658. *Sarothamnus scoparius* (L.) Wimm.; 4, (!), frequent within the area, Sp,  
 659. *Saxifraga granulata* L.; 2, (!), Ra, MK, Br, Sp,  
 660. *Scabiosa canescens* Waldst. & Kit.; 1, (!), Op, VU, Sp,  
 661. *Scabiosa ochroleuca* L.; 4, (!), frequent within the area, Ap,  
 662. *Scirpus sylvaticus* L.; 3, (!), Pi, Ra, MK, Op, Bl, Sp,  
 663. \* *Scleranthus annuus* L.; 4, (!), frequent within the area, Arch,  
 664. *Scleranthus perennis* L.; 1, (!), Br, Ap,  
 665. *Scrophularia nodosa* L.; 3, (!), Pi, Ra, Bl, KP, PG, Mo, Sp,  
 666. *Scutellaria galericulata* L.; 2, (!), Ra, MK, Bl, Ch, Sp,

667. *Sedum acre* L.; 4, (!), frequent within the area, Ap,  
 668. *Sedum maximum* (L.) Hoffm.; 4, (!), frequent within the area, Sp,  
 669. *Sedum sexangulare* L.; 4, (!), frequent within the area, Sp,  
 670. \* *Sedum spurium* M. Bieb.; 3, (!), Pi, PG, KP, Op, Ci, Dia,  
 671. *Sedum villosum* L.; 1, Br (Schube 1903), RE, Sp,  
 672. *Senecio jacobea* L.; 4, (!), frequent within the area, Ap,  
 673. *Senecio nemorensis* L.; 4, (!), frequent within the area, Sp,  
 674. *Senecio ovatus* (P. Gaertn., B. Mey. & Scherb.) Willd.; 4, (!), frequent within the area, Sp,  
 675. \* *Senecio vernalis* Waldst. & Kit.; 4, (!), frequent within the area, K,  
 676. \* *Senecio viscosus* L.; 2, (!), Ch, Op, Br, Arch,  
 677. \* *Senecio vulgaris* L.; 4, (!), frequent within the area, Arch,  
 678. \* *Setaria pumila* (Poir.) Roem. & Schult.; 3, (!), Op, Ra, Le, KP, Zu, Zo, Le, Arch,  
 679. \* *Setaria viridis* (L.) P. Beauv.; 3, (!), Op, Pi, Do, Mo, Zu, Zo, Bl, PG, Arch,  
 680. \* *Sherardia arvensis* L.; 2, (!), PG, Ra, Co, Arch,  
 681. *Silaum silaus* (L.) Schinz & Thell.; 2, (!), Ra, Pi, MK, LC, Sp,  
 682. *Silene nutans* L.; 3, (!), Pi, Do, KP, Op, Br, Co, Sp,  
 683. *Silene vulgaris* (Moench) Garcke; 4, (!), frequent within the area, Sp,  
 684. \* *Sinapis arvensis* L.; 4, (!), frequent within the area, Arch,  
 685. \* *Sisymbrium loeselii* L.; 1, (!), PG, Br, K,  
 686. \* *Sisymbrium officinale* (L.) Scop.; 4, (!), frequent within the area, Arch,  
 687. *Sium latifolium* L.; 1, (!), Br, Ra, Sp,  
 688. *Solanum dulcamara* L.; 2, (!), Op, Bl, KP, Sp,  
 689. \* *Solanum nigrum* L.; 3, (!), Zu, Zo, Lw, Ch, Ra, Arch,  
 690. \* *Solidago canadensis* L.; 4, (!), frequent within the area, K,  
 691. \* *Solidago gigantea* Aiton; 4, (!), frequent within the area, K,  
 692. *Solidago virgaurea* L.; 3, (!), Ra, Op, Br, Bl, Ap,  
 693. *Sonchus arvensis* L.; 4, (!), frequent within the area, Ap,  
 694. \* *Sonchus asper* (L.) Hill; 4, (!), frequent within the area, Arch,  
 695. \* *Sonchus oleraceus* L.; 4, (!), frequent within the area, Arch,  
 696. *Sorbus aucuparia* L. em. Hedl.; 5, (!), common within the area, Sp,  
 697. \* *Spergula arvensis* L.; 4, (!), frequent within the area, Arch,  
 698. *Spergularia rubra* (L.) J. Presl & C. Presl; 4, (!), frequent within the area, Ap,  
 699. *Spiranthes spiralis* (L.) Chevall.; 1, Br (Fiek 1881, Schube 1903), RE, Sp,  
 700. \* *Stachys annua* (L.) L.; 1, (!), PG, Arch,  
 701. *Stachys palustris* L.; 2, (!), Op, Ra, Bl, Ap,  
 702. *Stachys sylvatica* L.; 3, (!), Pi, Op, Ra, Gr, Bl, Br, Sp,  
 703. *Stellaria graminea* L.; 4, (!), frequent within the area, Ap,  
 704. *Stellaria holostea* L.; 4, (!), frequent within the area, Sp,  
 705. *Stellaria media* (L.) Vill.; 5, (!), common within the area, Ap,  
 706. *Stellaria nemorum* L.; 2, (!), Op, Pi, Do, Bl, Sp,  
 707. *Stellaria palustris* Retz.; 2, (!), Ra, Br, Op, Sp,

708. *Stellaria uliginosa* Murray; 3, (!), Ra, Op, Pi, Do, Bl, Ch, Le, Sp,  
709. *Symphoricarpos albus* (L.) S. F. Blake; 2, (!), Op, PG, MK, K,  
710. *Symphytum officinale* L.; 4, (!), frequent within the area, Sp,  
711. *Symphytum tuberosum* L.; 3, (!), Gr, Ra, Pi, Bl, Ci, KP, Sp,  
712. *Syringa vulgaris* L.; 1, (!), Br, Ci, K,  
713. \* *Tanacetum parthenium* (L.) Sch. Bip.; 1, (!), Ch, K,  
714. *Tanacetum vulgare* L.; 4, (!), frequent within the area, Ap,  
715. *Taraxacum officinale* F. H. Wigg.; 5, (!), common within the area, Ap,  
716. *Thalictrum aquilegifolium* L.; 1, (!), Op, EN, Sp,  
717. *Thalictrum minus* L.; 1, Ci (Schube 1903), EN, Ap,  
718. \* *Thlaspi arvense* L.; 5, (!), common within the area, Arch,  
719. *Thymus pulegioides* L.; 4, (!), frequent within the area, Sp,  
720. *Thymus serpyllum* L. em. Fr.; 2, (!), Ch, KP, PG, Co, Sp,  
721. *Tilia cordata* Mill.; 5, (!), common within the area, Sp,  
722. *Tilia platyphyllos* Scop.; 2, (!), Pi, Gr, Op, Sp,  
723. *Torilis japonica* (Houtt.) DC.; 4, (!), frequent within the area, Ap,  
724. *Tragopogon orientalis* L.; 2, (!), Op, PG, Br, Ap,  
725. *Tragopogon pratensis* L.; 3, (!), Op, Br, Ra, Mo, Ci, Sp,  
726. *Trifolium arvense* L.; 4, (!), frequent within the area, Ap,  
727. *Trifolium aureum* Pollich; 2, (!), Ch, Pi, Do, Br, Ap,  
728. *Trifolium campestre* Schreb.; 4, (!), frequent within the area, Ap,  
729. *Trifolium dubium* Sibth.; 4, (!), frequent within the area, Ap,  
730. *Trifolium hybridum* L.; 2, (!), Pi, Ra, Br, Op, Sp,  
731. *Trifolium medium* L.; 1, (!), PG, Sp,  
732. *Trifolium montanum* L.; 1, (!), Lw, PG, Sp,  
733. *Trifolium pratense* L.; 5, (!), common within the area, Sp,  
734. *Trifolium repens* L.; 5, (!), common within the area, Ap,  
735. *Trisetum flavescens* (L.) P. Beauv.; 4, (!), frequent within the area, Sp,  
736. *Tussilago farfara* L.; 4, (!), frequent within the area, Ap,  
737. *Typha angustifolia* L.; 1, (!), Br, Sp,  
738. *Typha latifolia* L.; 2, (!), Op, Le, Ch, Bl, Sp,  
739. *Ulmus glabra* Huds.; 4, (!), frequent within the area, Sp,  
740. *Ulmus laevis* Pall.; 4, (!), frequent within the area, Sp,  
741. *Ulmus minor* Mill.; 2, (!), Do, Mo, Bl, Ci, Sp,  
742. *Urtica dioica* L.; 5, (!), common within the area, Ap,  
743. \* *Urtica urens* L.; 4, (!), frequent within the area, Arch,  
744. *Vaccinium myrtillus* L.; 5, (!), common within the area, Sp,  
745. *Vaccinium vitis-idaea* L.; 4, (!), frequent within the area, Sp,  
746. *Valeriana angustifolia* Tausch.; 1, Zu (Rostański 1970), EN, Sp,  
747. *Valeriana dioica* L.; 1, (!), Ra, NT, Sp,  
748. *Valeriana officinalis* L.; 3, (!), Op, Pi, Ra, Br, Bl, Ch, Sp,  
749. *Valeriana sambucifolia* J. C. Mikan; 2, (!), Op, Bl, Pi, Sp,

750. \* *Valerianella dentata* (L.) Pollich; 1, (!), KP, Mo, Arch,  
 751. \* *Valerianella locusta* Laterr. em. Betcke; 2, (!), Op, Mo, Zu, Ci, Arch,  
 752. *Veratrum lobelianum* Bernh.; 2, (!), between Op and Pi, to the W from Pi (Nowak,  
 Nowak 2003), Co, VU, Sp,  
 753. *Verbascum lychnitis* L.; 2, (!), Le, Lw, KP, Ap,  
 754. *Verbascum nigrum* L.; 3, (!), Pi, Op, Le, Ch, Ci, Br, Sp,  
 755. *Verbascum phlomoides* L.; 1, (!), Br, Ra, Zu, Sp,  
 756. *Verbascum thapsus* L.; 3, (!), Op, KP, PG, Ci, Br, Do, Pi, Sp,  
 757. \* *Verbena officinalis* L.; 2, (!), PG, Ch, KP, Ci, Arch,  
 758. *Veronica anagallis-aquatica* L.; 2, (!), Op, KP, Bl, MK, Sp,  
 759. \* *Veronica arvensis* L.; 4, (!), frequent within the area, Arch,  
 760. *Veronica beccabunga* L.; 3, (!), Op, Pi, MK, Le, Ch, Bl, Sp,  
 761. *Veronica chamaedrys* L.; 5, (!), common within the area, Ap,  
 762. *Veronica dillenii* Crantz; 2, (!), KP, Ch, Lw, Pi, Sp,  
 763. *Veronica hederifolia* L.; 5, (!), common within the area, Ap,  
 764. *Veronica officinalis* L.; 2, (!), Gr, Do, Pi, Br, Sp,  
 765. \* *Veronica persica* Poir.; 5, (!), common within the area, K,  
 766. *Veronica serpyllifolia* L.; 1, (!), Pi, Br, Ap,  
 767. *Veronica teucrium* L.; 1, (!), Pi (Nowak, Nowak 1999), VU, Sp,  
 768. *Viburnum opulus* L.; 4, (!), frequent within the area, Sp,  
 769. *Vicia angustifolia* L.; 1, (!), Ch, PG, Arch,  
 770. *Vicia cassubica* L.; 2, (!), KP, Pi, Op, EN, Sp,  
 771. *Vicia cracca* L.; 4, (!), frequent within the area, Ap,  
 772. \* *Vicia hirsuta* (L.) S. F. Gray; 4, (!), frequent within the area, Ap,  
 773. *Vicia sepium* L.; 4, (!), frequent within the area, Sp,  
 774. *Vicia sylvatica* L.; 2, (!), Gr, Br, Ch, NT, Sp,  
 775. *Vicia tenuifolia* Roth; 1, (!), Br, Ch, VU, Sp,  
 776. \* *Vicia tetrasperma* (L.) Schreb.; 2, (!), Op, Mo, Zu, Ci, Arch,  
 777. \* *Vicia villosa* Roth; 4, (!), frequent within the area, Arch,  
 778. *Vinca minor* L.; 4, (!), frequent within the area, LC, Ap,  
 779. \* *Viola arvensis* Murray; 5, (!), common within the area, Arch,  
 780. *Viola canina* L.; 4, (!), frequent within the area, Sp,  
 781. *Viola hirta* L.; 1, (!), Br, VU, Ap,  
 782. *Viola mirabilis* L.; 1, Ra (Schube 1903), EN, Sp,  
 783. \* *Viola odorata* L.; 4, (!), frequent within the area, Ap,  
 784. *Viola reichenbachiana* Jord. ex Boreau; 5, (!), common within the area, Sp,  
 785. *Viola riviniana* Rchb.; 5, (!), common within the area, Sp,  
 786. *Viola tricolor* L.; 2, (!), Op, Mo, Do, Ra, Ci, Ap,  
 787. *Viscaria vulgaris* Röhl.; 4, (!), frequent within the area, Sp,  
 788. *Viscum album* L. subsp. *album*; 2, (!), Pi, KP, Ap,



Explanations: (!) – locality confirmed by the authors, EX – extinct in Opole Silesia, CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened, LC – least concern, DD – data deficient, Ap – apophyte, Sp – spontaneophyte, Ken – kenophyte, Arch – archeophyte, Dia – diaphyte, others – see methods.

## Streszczenie

### *Flora wschodniej części Gór Opawskich w południowo-zachodniej Polsce*

Artykuł przedstawia wyniki prac florystycznych przeprowadzonych w latach 2005 – 2006 we wschodniej części Gór Opawskich – najdalej na wschód wysuniętej części polskich Sudetów położonych na Śląsku Opolskim. Flora badanego terenu, pomimo znacznych zmian spowodowanych antropopresją odznacza się znacznym bogactwem. Łącznie stwierdzono tu 788 gatunków roślin naczyniowych, w znaczącej większości natyfitów. To wyjątkowa wielkość w skali województwa porównywalna pod względem bogactwa gatunkowego z główną częścią Gór Opawskich. Wśród odnotowanych taksonów aż 128 gatunków zostało uznanych za zagrożone w skali regionu. Dwa spośród nich - *Dactylorhiza sambucina* i *Orchis mascula*, swoje ostatnie stanowiska na Śląsku Opolskim mają na badanym terenie. Największymi stratami dla różnorodności florystycznej badanego obszaru jest zanik takich taksonów jak: *Gentianella bohemica*, *Campanula cervicaria*, *Sedum villosum*, *Spiranthes spiralis*, *Phyteuma orbiculare* i *Pinguicula vulgaris*. Głównym powodem ustępowania niektórych rzadkich i zagrożonych gatunków jest intensywne rolnictwo, a także leśnictwo i działalność górnicza. Jednakże wskaźniki synantropizacji są tu relatywnie niskie w porównaniu do flory całego regionu.



## RED-LIST OF BRYOPHYTES OF OPOLE PROVINCE (POLAND)

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**ABSTRACT:** This paper contains new Red-list of bryophytes of Opole Province. It comprises 2 species of hornworts (all known from Opole Province), 56 liverwort species (about 67% of Opole Province hepaticoflora) and 146 species and 2 varieties of moss taxa (about 48% of Opole Province muscoflora).

**KEY WORDS:** mosses, liverworts, hornworts, red-list, threatened plants, Opole Province, Silesia, Poland

### *Introduction*

Information about the bryoflora of Opole Province concerning time till the end of 2004 was set out by Stebel (2004). In the years 2005 and 2006 further investigations on the flora of bryophytes were carried out in this area. At present, the bryoflora of Opole Province comprises 2 species of hornwort (50% of hornwort species known from Poland), 84 species and 2 subspecies of liverwort (about 36% of hepaticoflora of Poland) and 346 species and 12 varieties of moss (about 49% of muscoflora of Poland). The first Red-list of Bryophytes of Opole Province was elaborated by Jędrzejko (1997a, b). Since now there are much more available information about bryoflora of this region, the new list is more precise. Unfortunately, in case of many species this knowledge is still not sufficient to evaluate the level of their threat.

**Red-list**

The Red-list of threatened bryophytes of Opole Province comprises 2 hornwort species (all known from Opole Province), 56 liverwort species (about 67% of Opole Province hepaticoflora) and 146 species and 2 varieties of moss (about 42% of Opole Province muscoflora).

For whole Poland these numbers of threatened species are: hornworts – 50% (Klama 2006), liverworts – 39% (Klama 2006) and mosses – 33% (Żarnowiec et al. 2004).

Extinction of bryophytes in the area of Opole Province occurs on a scale exceeding the average value of Poland. Most important factors which influence on the diminishing of many populations are: (1) intensive farming, (2) intensive forestry, (3) urbanization, (4) air pollution and associated habitat acidification, (5) drainage and river and streams regulation, (6) water pollution, (7) exploitation of minerals and (8) exploitation of peat-bogs. Like in other regions of Poland, most endangered are peat-bog, epiphytic and aquatic bryophytes.

Very high percentage of threatened liverworts is worth mentioning. Recently in Poland extinguishing of this group of plants has been observed. Nowadays its larger refugia are located in mountains, lake districts and in Białowieża Primeval Forest, however in these places vanishing of liverworts is observed, too. Reasons of this phenomena are not wholly known. In the area of Opole Province there are no refugia big enough to efficiently protect stations of these plants, that is why in the future, if these tendencies do not change, extinction of many species of liverworts should be taken into consideration.

Since data concerning the preservation state of populations of threatened species are still insufficient, particular taxa have been classified according to the 'old' threat categories of IUCN (1978).

Threatened bryophytes are set out in alphabetical order in Table 1. Liverwort and hornwort nomenclature follows Grolle and Long (2000) and that of mosses Ochyra et al. (2003).

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## Streszczenie

### *Czerwona lista mszaków województwa opolskiego*

Praca prezentuje czerwoną listę mszaków województwa opolskiego. Znalazły się na niej 2 gatunki glewików (100% flory glewików znanej z Opolszczyzny), 56 gatunków wątrobowców (około 67% hepaticoflory) i 146 gatunków i 2 odmiany mchów (około 42% muskoflory).

Wymieranie mszaków na terenie województwa opolskiego zachodzi w skali przekraczającej średnią wartość dla Polski. Do najważniejszych czynników powodujących zanikanie populacji mszaków należą: (1) intensywne rolnictwo, (2) intensywna gospodarka leśna, (3) urbanizacja, (4) zanieczyszczenia atmosfery i związane z tym zakwaszenie siedlisk, (5) melioracje odwadniające oraz regulacje rzek i potoków, (6) zanieczyszczenie wód, (7) eksploatacja surowców mineralnych oraz (8) eksploatacja torfowisk. Podobnie jak w innych regionach kraju, najbardziej narażone są mszaki torfowiskowe i bagienne, nadrzewne (epifityczne) i wodne.

Na uwagę zasługuje bardzo wysoki odsetek flory zagrożonych wątrobowców. Od pewnego czasu obserwuje się w Polsce wymieranie tej grupy roślin. Obecnie jej większe ostoje w Polsce znajdują się na terenach górskich, na pojezierzach oraz w Puszczy Białowieskiej, chociaż i tu obserwuje się zanikanie tych roślin. Przyczyny tego zjawiska nie są dokładnie znane. Na terenie województwa opolskiego brak większych ostoi, mogących skutecznie zabezpieczać stanowiska omawianej grupy roślin, stąd też w przyszłości należy liczyć się, jeżeli kierunki przemian nie ulegną zmianie, z wymarciem znacznej części wątrobowców.

Gatunki zagrożone zestawiono w tabeli 1. Ze względu na ciągle niewystarczającą liczbę danych o stanie zachowania ich populacji, taksony klasyfikowano według 'starej' wersji kategorii zagrożeń zaproponowanych przez Międzynarodową Unię Ochrony Przyrody i Zasobów Naturalnych (IUCN 1978).

Nazwy glików i wątrobowców przyjęto za Grollem i Longiem (2000) natomiast mchów za Ochyra i in . (2003).

Table 1. Red-list of bryophytes in Opole Province.

Taxon	Threat category				
	Ex	E	V	R	I
Hornworts Anthocerotophyta					
<i>Anthoceros agrestis</i> Paton	-	-	-	●	-
<i>Phaeoceros carolinianus</i> (Michx.) Prosk.	-	-	-	●	-
Liverworts Marchantiophyta					
<i>Barbilophozia barbata</i> (Schmidel ex Schreb.) Loeske	-	-	●	-	-
<i>Bazzania trilobata</i> (L.) Gray	-	-	●	-	-
<i>Blepharostoma trichophyllum</i> (L.) Dumort.	-	●	-	-	-
<i>Calypogeia fissa</i> (L.) Raddi	-	-	-	-	●
<i>C. neesiana</i> (C.Massal. & Carestia) Müll.Frib.	-	-	-	-	●
<i>C. sphagnicola</i> (Arnell & J.Perss.) Warnst. & Loeske	-	●	-	-	-
<i>C. suecica</i> (Arnell & J.Perss.) Müll.Frib.	-	●	-	-	-
<i>Cephalozia connivens</i> (Dicks.) Lindb.	-	-	●	-	-
<i>C. lacinulata</i> J.B.Jack ex Spruce	-	●	-	-	-
<i>C. lunulifolia</i> (Dumort.) Dumort.	-	●	-	-	-
<i>C. pleniceps</i> (Austin) Lindb.	-	●	-	-	-
<i>Cephaloziella hampeana</i> (Nees) Schiffn.	-	-	-	●	-
<i>C. integerrima</i> (Lindb.) Warnst.	●	-	-	-	-
<i>Cladopodiella fluitans</i> (Nees) H.Buch	-	●	-	-	-
<i>Diplophyllum albicans</i> (L.) Dumort.	-	-	-	●	-
<i>D. obtusifolium</i> (Hook.) Dumort.	-	●	-	-	-
<i>Fossombronia wondraczekii</i> (Corda) Lindb.	-	-	-	●	-
<i>Frullania dilatata</i> (L.) Dumort.	-	●	-	-	-
<i>F. tamarisci</i> (L.) Dumort.	●	-	-	-	-
<i>Gymnocolea inflata</i> (Huds.) Dumort.	-	-	●	-	-
<i>Jamesoniella autumnalis</i> (DC.) Steph.	-	●	-	-	-
<i>J. hyalina</i> Lyell	-	●	-	-	-

<i>J. leiantha</i> Grolle	-	-	●	-	-
<i>Lejeunea cavifolia</i> (Ehrh.) Lindb.	-	●	-	-	-
<i>Leiocolea badensis</i> (Gottsche) Jörg.	-	-	-	●	-
<i>Lophocolea minor</i> Nees	-	-	-	●	-
<i>Lophozia bicrenata</i> (Schmidel ex Hoffm.) Dumort.	-	-	-	●	-
<i>L. excisa</i> (Dicks.) Dumort.	-	-	-	●	-
<i>L. incisa</i> (Schrad.) Dumort.	-	-	-	●	-
<i>L. sudetica</i> (Nees ex Huebener) Grolle	-	-	-	●	-
<i>Metzgeria furcata</i> (L.) Dumort.	-	-	●	-	-
<i>M. conjugata</i> Lindb.	-	-	-	-	●
<i>Mylia anomala</i> (Hook.) Gray	-	●	-	-	-
<i>Nardia geoscyphus</i> (De Not.) Lindb.	-	-	-	●	-
<i>N. scalaris</i> Gray	-	-	-	-	●
<i>Nowellia curvifolia</i> (Dicks.) Mitt.	-	●	-	-	-
<i>Pallavicinia lyellii</i> (Hook.) Carruth.	-	-	-	●	-
<i>Plagiochila asplenioides</i> (L. emend. Taylor) Dumort.	-	-	●	-	-
<i>Porella x baueri</i> (Schiffn.) C.E.O.Jensen	-	●	-	-	-
<i>P. cordaeana</i> (Huebener) Moore	-	-	-	-	●
<i>P. platyphylla</i> (L.) Pfeiff.	-	-	●	-	-
<i>Preissia quadrata</i> (Scop.) Nees	-	-	-	●	-
<i>Ptilidium ciliare</i> (L.) Hampe	-	-	-	-	●
<i>Radula complanata</i> (L.) Dumort.	-	-	●	-	-
<i>Riccardia chamaedryfolia</i> (With.) Grolle	●	-	-	-	-
<i>R. latifrons</i> (Lindb.) Lindb.	-	●	-	-	-
<i>R. multifida</i> (L.) Gray	●	-	-	-	-
<i>Riccia canaliculata</i> Hoffm.	-	-	-	-	●
<i>R. ciliata</i> Hoffm.	-	●	-	-	-
<i>R. huebeneriana</i> Lindenb.	-	-	-	-	●
<i>Scapania compacta</i> (A.Roth) Dumort.	-	-	-	-	●
<i>S. curta</i> (Mart.) Dumort.	-	-	-	●	-
<i>S. irrigua</i> (Nees) Nees	-	-	-	●	-
<i>Tritomaria exsecta</i> (Schmidel) Loeske	-	●	-	-	-
<i>T. exsectiformis</i> (Breidl.) Loeske	-	●	-	-	-
<i>Trichocolea tomentella</i> (Ehrh.) Dumort.	-	●	-	-	-
Mosses Bryophyta					
<i>Acaulon muticum</i> (Schreb. ex Hedw.) Müll.Hal.	-	-	●	-	-
<i>Aloina aloides</i> (Koch ex Schultz) Kindb.	-	●	-	-	-
<i>A. brevirostris</i> (Hook. & Grev.) Kindb.	-	-	-	●	-
<i>Amblystegium radicale</i> (P.Beauv.) Schimp.	-	-	-	●	-

<i>Andreaea rupestris</i> Hedw.	-	-	●	-	-
<i>Anomodon attenuatus</i> (Hedw.) Huebener	-	-	●	-	-
<i>A. longifolius</i> (Schleich. ex Brid.) Hartm.	●	-	-	-	-
<i>A. rugelii</i> (Müll.Hal.) Keissl.	-	-	-	-	●
<i>A. viticulosus</i> (Hedw.) Hook. & Taylor	-	●	-	-	-
<i>Antitrichia curtispindula</i> (Timm ex Hedw.) Brid.	●	-	-	-	-
<i>Bartramia halleriana</i> Hedw.	-	-	-	-	●
<i>B. ithyphylla</i> Brid.	-	-	-	-	●
<i>B. pomiformis</i> Hedw.	-	-	-	-	●
<i>Brachythecium mildeanum</i> (Schimp.) Schimp.	-	-	●	-	-
<i>B. tommasinii</i> (Sendtn. ex Boulay) Ignatov & Huttunen	-	-	-	●	-
<i>Bryum algovicum</i> Sendtn. ex Müll.Hal.	-	-	-	-	●
<i>B. amblyodon</i> Müll.Hal.	-	-	-	-	●
<i>B. badium</i> (Bruch ex Brid.) Schimp.	-	-	-	-	●
<i>B. creberrimum</i> Taylor	-	-	-	-	●
<i>B. funckii</i> Schwägr.	-	-	-	-	●
<i>B. intermedium</i> (Brid.) Blandow	-	-	-	-	●
<i>B. knowltonii</i> Barnes	-	-	-	-	●
<i>B. pallens</i> Sw. ex anon. var. <i>pallens</i>	-	-	-	-	●
<i>B. pallens</i> var. <i>alpinum</i> (Bruch & Schimp.) Podp.	-	-	-	-	●
<i>B. pallescens</i> Schleich. ex Schwägr.	-	-	-	-	●
<i>B. turbinatum</i> (Hedw.) Turner	-	●	-	-	-
<i>B. uliginosum</i> (Brid.) Bruch & Schimp.	-	●	-	-	-
<i>B. warneum</i> (Röhl.) Brid.	-	-	-	-	●
<i>B. weigelii</i> Spreng.	-	●	-	-	-
<i>Buckiella undulata</i> (Hedw.) Ireland	-	-	-	-	●
<i>Bucklandiella heterosticha</i> (Hedw.) Bednarek-Ochyra & Ochyra	-	-	●	-	-
<i>Buxbaumia aphylla</i> Hedw.	-	●	-	-	-
<i>B. viridis</i> (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.	-	●	-	-	-
<i>Calliergon giganteum</i> (Schimp.) Kindb.	-	●	-	-	-
<i>Campylidium calcareum</i> (Crundwell & Nyholm) Ochyra	-	-	●	-	-
<i>Campylium polygamum</i> (Schimp.) Lange & C.E.O.Jensen	-	-	●	-	-
<i>C. stellatum</i> (Hedw.) Lange & C.E.O.Jensen var. <i>stellatum</i>	-	-	●	-	-
<i>C. stellatum</i> var. <i>protensum</i> (Brid.) Bryhn	-	-	●	-	-
<i>Campylopus fragilis</i> (Brid.) Bruch & Schimp.	-	-	-	-	●
<i>C. pyriformis</i> (Schultz) Brid.	-	-	-	-	●
<i>Codriophorus acicularis</i> (Hedw.) P.Beauv.	-	-	-	●	-
<i>C. aquaticus</i> (Brid. ex Schrad.) Bednarek-Ochyra & Ochyra	-	-	-	-	●
<i>Ctenidium molluscum</i> (Hedw.) Mitt.	-	-	●	-	-
<i>Dicranella crispa</i> (Hedw.) Schimp.	-	-	-	-	●
<i>D. subulata</i> (Hedw.) Schimp.	-	-	-	-	●



<i>Dicranodontium denudatum</i> (Brid.) E.Britton	-	-	-	●	-
<i>Dicranum bonjeanii</i> De Not.	-	●	-	-	-
<i>D. fuscescens</i> Sm.	-	-	-	-	●
<i>D. spurium</i> Hedw.	-	-	●	-	-
<i>D. viride</i> (Sull. & Lesq.) Lindb.	-	-	●	-	-
<i>Ditrichum pallidum</i> (Hedw.) Hampe	-	-	-	-	●
<i>D. pusillum</i> (Hedw.) Hampe	-	-	-	-	●
<i>Drepanocladus capillifolius</i> (Warnst.) Warnst.	-	-	-	-	●
<i>Drvtodon trichophyllus</i> (Grev.) Brid.	-	-	-	-	●
<i>Encalypta ciliata</i> Hedw.	-	●	-	-	-
<i>E. vulgaris</i> Hedw.	-	●	-	-	-
<i>Enthostodon fascicularis</i> (Hedw.) Müll.Hal.	-	●	-	-	-
<i>Ephemerum serratum</i> (Schreb. ex Hedw.) Hampe	-	-	-	●	-
<i>Eurhynchiastrum pulchellum</i> (Hedw.) Ignatov & Huttunen	-	-	-	-	●
<i>Fissidens fontanus</i> (Bach.Pyl.) Steudel	-	-	-	-	●
<i>F. incurvus</i> Starke ex Röhl.	-	-	-	-	●
<i>F. osmundoides</i> Hedw.	●	-	-	-	-
<i>Fontinalis antipyretica</i> Hedw.	-	-	●	-	-
<i>Guembelia longirostris</i> (Hook.) Ochyra & Żarnowiec	-	-	-	-	●
<i>G. ovalis</i> (Hedw.) Müll.Hal.	-	-	-	-	●
<i>G. tergestina</i> (Tomm. ex Bruch & Schimp.) Buys.	-	-	-	-	●
<i>Hamatocaulis vernicosus</i> (Mitt.) Hedenäs	-	●	-	-	-
<i>Helodium blandowii</i> (F. Weber & D.Mohr) Warnst.	-	●	-	-	-
<i>Heterocladium dimorphum</i> (Brid.) Schimp.	-	-	-	-	●
<i>H. heteropterum</i> (Brid.) Schimp.	-	-	-	●	-
<i>Homalia trichomanoides</i> (Hedw.) Schimp.	-	-	-	-	●
<i>Homalothecium philippeanum</i> (Spruce) Schimp.	-	-	-	●	-
<i>H. sericeum</i> (Hedw.) Schimp.	-	●	-	-	-
<i>Homomallium incurvatum</i> (Schrad. ex Brid.) Loeske	-	-	-	●	-
<i>Hygroamblystegium fluviatile</i> (Hedw.) Loeske	-	-	●	-	-
<i>H. tenax</i> (Hedw.) Jenn.	-	-	-	-	●
<i>Hygrohypnum luridum</i> (Hedw.) Jenn.	-	-	-	●	-
<i>Hypnum andoi</i> A.J.E.Sm.	-	-	-	-	●
<i>H. pratense</i> W.D.J.Koch ex Spruce	●	-	-	-	-
<i>Isothecium mvosuroides</i> Brid.	-	-	-	-	●
<i>Leptodictyum humile</i> (P.Beauv.) Ochyra	-	-	●	-	-
<i>Leucodon sciuroides</i> (Hedw.) Schwägr.	-	-	●	-	-
<i>Limprichtia cossonii</i> (Schimp.) L.E.Anderson, H.A.Crum & W.R.Buck	-	●	-	-	-
<i>Meesia triquetra</i> (L. ex Jolycl.) Ångstr.	●	-	-	-	-
<i>Microbryum davallianum</i> (Sm.) R.H.Zander	●	-	-	-	-
<i>Mnium spinulosum</i> Bruch & Schimp.	-	-	-	●	-

<i>Neckera complanata</i> (Hedw.) Huebener	-	●	-	-	-
<i>N. crispa</i> Hedw.	-	●	-	-	-
<i>N. pennata</i> Hedw.	●	-	-	-	-
<i>Orthotrichum gymnostomum</i> Bruch ex Brid.	●	-	-	-	-
<i>O. lyellii</i> Hook. & Taylor	-	●	-	-	-
<i>O. pallens</i> Bruch ex Brid.	-	-	-	-	●
<i>O. patens</i> Bruch ex Brid.	-	-	-	-	●
<i>O. stramineum</i> Hornsch. ex Brid.	-	●	-	-	-
<i>O. striatum</i> Hedw.	-	●	-	-	-
<i>O. tenellum</i> Bruch ex Brid.	-	-	-	-	●
<i>Oxyrrhynchium schleicheri</i> (R.Hedw.) Röhl	-	-	-	●	-
<i>Paludella squarrosa</i> (Hedw.) Brid.	●	-	-	-	-
<i>Palustriella commutata</i> (Hedw.) Ochyra	-	●	-	-	-
<i>Philonotis arnellii</i> Husn.	-	●	-	-	-
<i>Ph. caespitosa</i> Jur.	-	-	-	●	-
<i>Ph. calcarea</i> (Bruch & Schimp.) Schimp.	●	-	-	-	-
<i>Ph. fontana</i> (Hedw.) Brid.	-	-	●	-	-
<i>Ph. marchica</i> (Hedw.) Brid.	●	-	-	-	-
<i>Physcomitrium sphaericum</i> (C.F.Ludw. ex Schkuhr) Brid.	-	-	-	●	-
<i>Plasteurhynchium striatulum</i> (Spruce) M.Fleisch. ex Broth.	-	-	-	-	●
<i>Pohlia elongata</i> Hedw.	●	-	-	-	-
<i>Polytrichum strictum</i> Menzies ex Brid.	-	●	-	-	-
<i>Pseudocalliergon lycopodioides</i> (Brid.) Hedenäs	●	-	-	-	-
<i>P. trifarium</i> (F.Weber & D.Mohr) Loeske	●	-	-	-	-
<i>Pseudoleskeella catenulata</i> (Brid. ex Schrad.) Kindb.	-	●	-	-	-
<i>Pterygoneurum ovatum</i> (Hedw.) Dixon	-	●	-	-	-
<i>Ptilium crista-castrensis</i> (Hedw.) De Not.	-	-	●	-	-
<i>Racomitrium lanuginosum</i> (Hedw.) Brid.	-	-	-	-	●
<i>Rhabdoweisia crispata</i> (Dicks.) Lindb.	-	-	-	●	-
<i>Rh. fugax</i> (Hedw.) Bruch & Schimp.	-	-	-	-	●
<i>Rhynchostegiella tenella</i> (Dicks.) Limpr.	●	-	-	-	-
<i>Rhytidiadelphus loreus</i> (Hedw.) Warnst.	-	-	-	-	●
<i>Rh. triquetrus</i> (Hedw.) Warnst.	-	-	●	-	-
<i>Rhytidium rugosum</i> (Ehrh. ex Hedw.) Kindb.	●	-	-	-	-
<i>Rosulabryum elegans</i> (Nees) Ochyra	-	-	-	-	●
<i>Scorpidium scorpioides</i> (Hedw.) Limpr.	-	●	-	-	-
<i>Seligeria pusilla</i> (Hedw.) Bruch & Schimp.	-	-	-	-	●
<i>Serpoleskea confervoides</i> (Brid.) Loeske	-	-	-	-	●
<i>S. subtilis</i> (Hedw.) Loeske	-	●	-	-	-
<i>Sphagnum affine</i> Renauld & Cardot	-	●	-	-	-
<i>S. contortum</i> Schultz	-	●	-	-	-

<i>S. magellanicum</i> Brid.	-	-	●	-	-
<i>S. obtusum</i> Warnst.	-	●	-	-	-
<i>S. papillosum</i> Lindb.	-	-	●	-	-
<i>S. platyphyllum</i> (Braithw.) Warnst.	●	-	-	-	-
<i>S. riparium</i> Ångstr.	-	-	-	●	-
<i>S. rubellum</i> Wilson	-	-	-	-	●
<i>S. subnitens</i> Russow & Warnst.	-	●	-	-	-
<i>S. teres</i> (Schimp.) Ångstr.	-	-	●	-	-
<i>S. warnstorffii</i> Russow	-	●	-	-	-
<i>Syntrichia latifolia</i> (Bruch ex Hartm.) Huebener	-	-	-	●	-
<i>S. montana</i> Nees	-	-	-	-	●
<i>S. papillosa</i> (Wilson) Jur.	-	-	●	-	-
<i>S. virescens</i> (De Not.) Ochyra	-	-	-	-	●
<i>Thamnobryum alopecurum</i> (Hedw.) Gangulee	-	-	-	●	-
<i>Tomentypnum nitens</i> (Hedw.) Loeske	-	●	-	-	-
<i>Tortula lanceola</i> R.H.Zander	-	-	●	-	-
<i>Trichostomum tenuirostre</i> (Hook. & Taylor) Lindb.	-	-	-	-	●
<i>Ulota bruchii</i> Hornsch ex Brid.	-	●	-	-	-
<i>U. crispa</i> (Hedw.) Brid.	-	●	-	-	-
<i>Weissia brachycarpa</i> (Nees & Hornsch.) Jur.	-	-	-	-	●
<i>W. rostellata</i> (Brid.) Lindb.	-	-	-	-	●

**Key:** **Ex** – Extinct and probably extinct. The species which are no longer known to exist in Opole Province; **E** – Endangered. Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating; **V** – Vulnerable. Taxa believed likely to move in to the endangered category in the near future if the casual factors continue operating; **R** – Rare. Taxa with small populations that are not at present endangered or vulnerable but are at risk; **I** – Indeterminate. Taxa known to be extinct, endangered, vulnerable or rare but where is not enough information to say which of the four categories is appropriate.



**THE NEW LOCATION OF CORALLORHIZA TRIFIDA CHÂTEL.  
IN THE OPOLE SILESIA**

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**ABSTRACT:** *Cephalanthera rubra* is considered as a critically endangered taxon in the Opole voivodship. In last few years only one location was confirmed near Ligota Górna within the “Biesiec” Nature Reserve. The newly found population has very small size and consists of only 4 flowering specimens (2006). It is located ca. 1 km to the south from Górażdże in 80 year old beech tree stand belonging to the association of *Luzulo pilosae-Fagetum*.

**KEY WORDS:** threatened plants, *Corallorhiza trifida*, Opole province, flora conservation

#### Introduction

*Corallorhiza trifida* is a perennial rhizomous plant of inflorescence shoots from (8)10 to 20(25) cm high, with 2-4 hulls. The plant is saprophytic, brownish, sometimes yellowish, without leaves and roots. Small flowers are assembled in loose inflorescences formed by 3 to 15 flowers of colouration from light green, yellowish to light purple. It flowers in second part of May, in June and in higher mountain elevation also in July. This plant reproduces mainly from seeds and only sporadically vegetatively (Bernacki 1999, Buttler 2000).

*Corallorhiza trifida* occurs mostly in deciduous forests (*Fagion*), and, especially in mountains coniferous forest from the *Vaccicio-Piceion* alliance (Bernacki 1999). It prefers fresh fertile soils, usually rich in calcium carbonate. In the Opole region *Corallorhiza trifida* occurred in a fertile beech forests *Dentario-enneaphyllidis-*

*Fagetum* (Spalek 1997) and probably also in thermophilous beech forest with orchids from the sub-alliance *Cephalanthero-Fagenion*.

*Corallorhiza trifida* is an circumboreal sub-element (Zajac and Zajac ed. 1997). In Poland it occurs in dispersion over the whole area, especially in northern regions, in Silesian Uppland and in mountain ranges, totally in ca. 170 locations (Zajac and Zajac 2001). In the Opole voivodship *Corallorhiza trifida* has been reported from 9 localities. It has been recorded in the meso-region of the calcareous Chełm Massif: Ligota Dolna (Spalek 1997), Górażdże and nature reserve Kamień Śląski (Fiek 1881, Schube 1903, Krawiecowa and Kuczyńska 1970), from Opawskie Mts. in Braciszów (Wimmer 1844, Fiek 1881, Schube 1903) and from Głubczyce Plateau: Głusko, Las Głubczycki, Baborów, Lisięcice and Zubrzyce (Wimmer 1844, Fiek 1881, Schube 1903). In recent years only the location in Ligota Dolna was regarded as still existing, however, it was reported once in 1997 and then during following years, despite intense monitoring, were not confirmed. It is also worth noticing that this population consists only of 1 individual. So the situation of the species was very critical and it was listed in the red list of vascular plants of Opole Province as well as in the red data book of Opole voivodeship as critically endangered (Spalek 2002, Nowak et al. 2003).

*Corallorhiza trifida* is considered also as a critically endangered taxon in Lower Silesia, endangered in Wielkopolska and Upper Silesia, vulnerable in Łódź Province (Żukowski and Jackowiak 1995, Parusel et al. 1996, Jakubowska-Gabara and Kucharski 1999, Kački et al. 2003 ;). At the scale of Poland the species is considered as vulnerable (Zarzycki and Szelağ 2006) and the Czech Republic it has been also assigned to a high risk of threat, to endangered category (Procházka ed. 2001). This plant is a subject of a strict species protection in Poland.

The main reason of disappearance of *Corallorhiza trifida* is intensive forest management, in particular – logging of mature beech stands and preference for pine plantings in deciduous forest habitats due to underestimation of habitat fertility class.

### ***The new location***

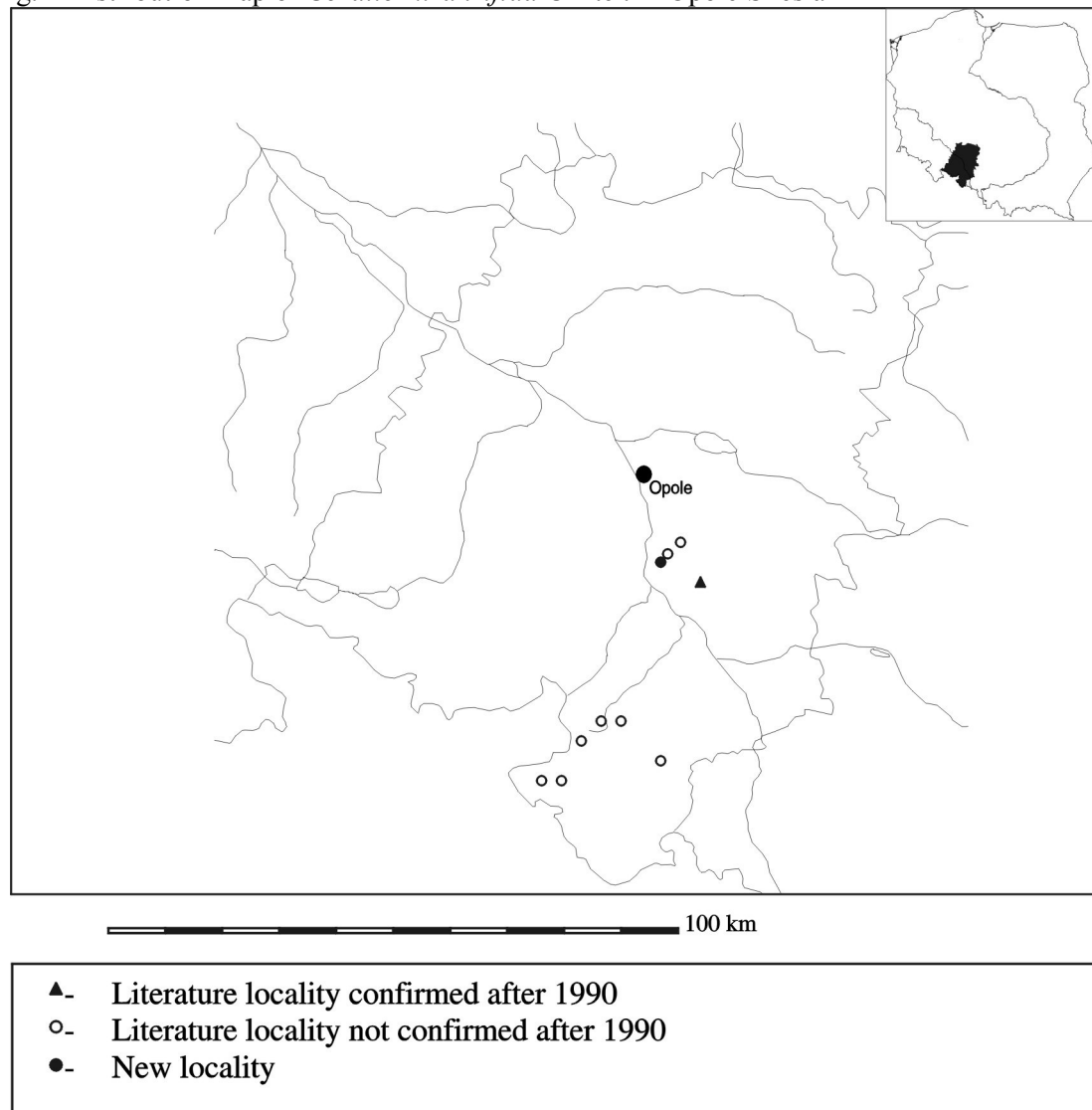
A new site of *Corallorhiza trifida* is located to the SE from Górażdże (N 50° 31' 03", E 18° 00' 53"; ATPOL square: CF16, see Fig. 1). It is beech forest complex with some patches completely changed by human forestry, but in some fragments with well developed phytocoenoses of *Cephalanthero-Fagenion* suballiance and *Galio odorati-Fagetum* associations. A few specimens of *Corallorhiza trifida* grow almost in forest road verge in quite natural tree stand ca. 80 years old belonging to *Luzulo pilosae-Fagetum* association. Floristic composition of the community in which *Corallorhiza trifida* has been recorded is presented in the relevé below:

Date: 15.05.2006; height: 191 m a. s. l.; surface: 200m<sup>2</sup>; cover of the tree layer (a) – 85%, cover of the shrub layer (b) – 20%, cover of the herb layer (c) – 40%, cover of the moss layer (d) – 5%; number of species in relevé – 18; ChCl. Querco-Fagetea: *Anemone nemorosa* 1, *Carex digitata* +, *Melica nutans* +, ChO. Fagetalia sylvaticae: *Viola reichenbachiana* 2, *Sanicula europaea* +, ChAll. Fagion: *Fagus sylvatica* a 5, b 2,

Ch.Ass. *Luzulo pilosae*-Fagetum: *Luzula pilosa* +, *Carex pilulifera* +, Others: *Corallorhiza trifida* +, *Quercus petraea* b 1, *Ajuga reptans* 2, *Berberis vulgaris* +, *Cornus sanguinea* r, *Cruciata glabra* +, *Geum urbanum* +, *Hieracium murorum* +, *Pinus sylvestris* r, *Quercus rubra* +, *Vaccinium myrtillus* r, *Hypnum cupressiformae* d 1.

The newly discovered site seems to be not threatened by humans. There are no forthcoming clear cuttings in the area planned. Forest administration (Nadleśnictwo Strzelce Opolskie) when informed about the location of *Corallorhiza trifida* decided to take this place under protection. Of course there still exists the probability that direct human impact, for example gathering of the specimens to the herbarium collections, could cause immediate destroying of the population, but such situation nowadays are very rare in the region. There are also no visible natural endangerments of the population and its habitat from e.g. natural succession or alien plants invasions.

Fig. 1 Distribution map of *Corallorhiza trifida* ChÄtel. in Opole Silesia



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## **Streszczenie**

Nowe stanowisko żłobika koralowego *Corallorhiza trifida* Châtel. na Śląsku Opolskim

Żłobik koralowy jest taksonem krytycznie zagrożonym w województwie opolskim. Aktualnie w regionie istnieją tylko 2 stanowiska tego gatunku: w rezerwacie Biesiec oraz nowo odkryte stanowisko na S od Górażdzy. Stanowisko w Bieścu odkryte przed kilkoma laty nie zostało ponownie odnalezione. Wielkości populacji na znanych stanowiskach są skrajnie małe i liczą od 1 kwitnącego osobnika w rezerwacie Biesiec do 4 zanotowanych na stanowisku k. Górażdzy. Nowe stanowisko żłobika koralowego zostało odnalezione w maju 2006 roku w średniowiekowym drzewostanie bukowym na południowy zachód od miejscowości Górażdże. Populacja żłobika rośnie, tu w pobliżu drogi leśnej w zacienionym miejscu w ubogogatunkowym płacie kwaśnej buczyny niżowej *Luzulo pilosae-Fagetum*.



***EMBLETHIS DENTICOLLIS* AND *HETEROGASTER CATHARIAE* (HEMIPTERA:  
HETEROPTERA) IN POLAND, WITH REMARKS ON TEN OTHER HETEROPTERANS  
RARELY COLLECTED IN POLAND**

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**ABSTRACT:** New records of ten Heteroptera rarely collected in Poland are presented, as follows: *Dufouriellus ater* (Anthocoridae) and *Ischnodemus sabuleti* (Blissidae) – both the second record in Lower Silesia and the first after 70 years break; *Elatophilus nigricornis* (Anthocoridae) – the third Polish record and the first in Lower Silesia; *Himacerus major* (Nabidae) – the first record in Eastern Sudetes; *Acalypta carinata* (Tingidae) – the first locality in Lower Silesia; *Tingis crispata* (Tingidae) – the third locality in Poland; *Hypsoloecus visci* (Miridae) – the second locality in Poland; *Pseudoloxops coccineus* (Miridae) – the first record in Eastern Sudetes; *Aellopus atratus* (Rhyparochromidae) – the first record in Pomeranian Lake District; *Pionosomus opacellus* (Rhyparochromidae) – the second record in Poland. The occurrence of *Emblethis denticollis* (Rhyparochromidae) in Poland, species not included in the recent checklist of Polish Heteroptera, is confirmed. Moreover, *Heterogaster cathariae* (Heterogastridae) is recorded for the first time in our country; because of its collecting site character its presence in natural conditions should be confirmed in Poland.

**KEY WORDS:** Hemiptera, Heteroptera, Anthocoridae, Nabidae, Tingidae, Miridae, Blissidae, Heterogastridae, Rhyparochromidae, Poland, faunistics, new records

***Introduction***

Although the Heteroptera fauna of Poland can be at present estimated at about 750-770 species, it is not as rich as this of neighboring countries (J.A. Lis 2001, Gorczyca 2004); fortunately, species new to the Polish fauna are still discovered and old doubtful records are confirmed (e.g. Lis and Lis 2002, 2004; B. Lis et. al. 2004). The present paper

includes data on the species recorded for the first time in Poland and the species regarded hitherto as absent in our fauna, as well as data concerning ten species rarely or very rarely collected in our country.

Majority of the material for this study has been collected by the authors; the following abbreviations are used to indicate the place where the material is housed: UO – Department of Biosystematics, University of Opole, Opole, MiZPAS – Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw.

## ***Faunistics***

### ***Anthocoridae***

#### ***Dufouriellus ater*** (DUFOUR, 1833)

LOWER SILESIA: 1 ex., Suchy Bór [UTM: BB 91] near Opole, on building wall in the village center, 27.07.2006, leg. B. Lis (UO). In Poland rarely recorded; in Lower Silesia known only from a vicinity of Wrocław, where it has been recorded more than 70 years ago (Scholz 1931). The present locality is the second one in the region.

#### ***Elatophilus nigricornis*** (ZETTERSTEDT, 1838)

LOWER SILESIA: 1 ex., Suchy Bór [BB 91] near Opole, close to forest, on a detached house wall, 5.05.2006, leg. B. Lis (UO). Up to date known only from the Tuchola Forests in Pomeranian Lake District (Cmoluchowa and Lechowski 1993) and Trzebnica Hills (Lis and Lis 1997). New to Lower Silesia.

### ***Nabidae***

#### ***Himacerus major*** (A. COSTA, 1842)

EASTERN SUDETES: 1 ex., Śnieżnik Massif [XR 36], lower subalpine forest, 8.08.2000, leg. P. Drzewocin (UO); Głębczyce [YR 06], 1 ex. 2.09.2001, 1 ex. 30.07.2002, leg. J. Kruszewska (UO). This predacious species has been very rarely collected in Poland; hitherto known only from several localities in eastern regions of our country, i.e. Podlasie (Strawiński 1965) and Roztocze (Strawiński, 1956, 1959, 1964). New to Eastern Sudetes.

### ***Tingidae***

#### ***Acalypta carinata*** (PANZER, 1806)

LOWER SILESIA: 1 ex., Suchy Bór [BB 91] near Opole, close to forest, on a detached house wall, 15.05.2006, leg. B. Lis (UO). Known only from over a dozen localities all over the country; listed also vaguely from Silesia (Scholtz 1847, 1850; Assmann 1854; Scholz 1931), but without precise location. The first locality in Lower Silesia.

#### ***Tingis crispata*** (HERRICH-SCHAEFFER, 1838)

WIELKOPOLSKO-KUJAWSKA LOWLAND: 1 ex., Ruda Milicka [XT 51] near Milicz, meadow, 2.06.2000, leg. B. and J.A. Lis (UO). Species very rarely collected in Poland, up to date known only from two particular localities, namely Zielonka Primeval Forest in Wielkopolsko-Kujawska Lowland (Skórka 1994) and Bielinek on Odra nature

reserve in Pomeranian Lake District (B. Lis 2001). It was reported vaguely also from Silesia, but no precise locality was given (Stichel 1960, Péricart 1983). Thus, the site in Ruda Milicka is the third exact locality of this species in Poland.

### *Miridae*

#### *Hypsoloecus visci* (PUTON, 1888)

UPPER SILESIA: 1 ex., Łęczok nature reserve, *Circaeo-Alnetum*, 08.07.2001, leg. A. Furgoń (UO). It is its second record in Poland; up to date collected only from Bielinek on Odra in Pomeranian Lake District (Hedicke and Michalk 1934).

#### *Pseudoloxops coccineus* (MEYER-DÜR, 1843)

EASTERN SUDETES: 1 ex., Głubczyce [YR 06], 30.07.2002, leg. J. Kruszewska (UO). In Poland, known only from over a dozen localities. New to Eastern Sudetes, and the first record in Sudetes as a whole.

### *Blissidae*

#### *Ischnodemus sabuleti* (FALLÉN, 1826)

LOWER SILESIA: 2 exx., Suchy Bór [BB 91] near Opole, sandy meadow close to forest, 1.05.2005, leg. P. Lis (UO). Not often recorded from Poland, known from single localities in its different regions. The present locality is its second record in Lower Silesia and the first after more than 70 years break (Scholz 1931).

### *Heterogastridae*

#### *Heterogaster cathariae* (GEOFFROY, 1785)

CRACOW-WIELUŃ UPLAND: 1 ex., Kraków [Cracow], Bronowice [DA 24], Medicinal Plants Research Station, 3.08.1954, leg. A. Giżycka, on *Nepeta melissifolia* Lam. (MiZPAS). A single female of this species has been found among specimens in the collection of the Zoological Museum of the Polish Academy of Sciences in Warsaw. The nature of this finding is very unclear, because the specimen was collected more than 50 years ago and, as the most important, on plant species (*Nepeta melissifolia*) not native to Poland, but still planting in the Medicinal Plants Research Station in Cracow. Because *H. cathariae* feeds on different species of *Nepeta*, *Salvia* and *Melissa* and occurs also in Czech Republic and Slovakia (Péricart 2001) one may not exclude a possibility it lives also in natural conditions in southern regions of Poland. *H. cathariae* can easily be distinguished from two other Polish species of the genus; it differs from *H. artemisiae* Schill. by its entirely dark antennae (antennal segments are clearly bicoloured in the latter), and from *H. urticae* (F.) by the absence of long hairs on head and legs (such long erect hairs are clearly visible in the latter) and by the presence of two dark coloured bands on tibiae (three dark bands are present in the latter).

### *Rhyparochromidae*

#### *Aellopus atratus* (GÖEZE, 1778)

POMERANIAN LAKE DISTRICT: 7 exx. (5 imagines, 2 nymphs), Zamrzenica [XV 93] near Bysławek, 10.08.2003, sandy habitats, pine forest edges, leg. B. and J.A. Lis (UO). Species rarely collected in Poland, hitherto known only from five localities, namely Gdańsk at the Baltic Sea Coast (Siebold 1839, Stichel 1960), Jedlina-Zdrój in Western Sudetes (Scholz 1931), Wrocław and Miękinia in Lower Silesia (Scholz 1931), and Kraków (Cracow) in Krakowsko-Wieluńska Upland (Smreczyński 1954). New to Pomeranian Lake District.

#### *Emblethis denticollis* HORVÁTH, 1878

LOWER SILESIA: Suchy Bór [BB 91] near Opole, 2 exx. 30.08.2005, 1 ex. 28.08.2006, sandy meadow close to forest, leg. B. Lis (UO). Species recorded only once from the present territory of Poland; it was collected in a gravel-pit in Bielinek on Odra in Pomeranian Lake District (Engel and Hedicke 1934, Hedicke and Michalk 1934). The species was listed from Poland with a question mark (as "PL?") in the catalogue of the Palaearctic Heteroptera (Péricart 2001), and omitted in the recent checklist of Polish Heteroptera (Gorczyca 2004). Thus, the present record confirms its occurrence in our country.

#### *Pionosomus opacellus* HORVÁTH, 1895

MAZOVIAN LOWLAND: 1 ex, Młociny [DC 99] near Warsaw, 14.04.1959, leg. D. Karczewska (MiZPAS). Species known in Poland only from a single very old record, namely Gdańsk-Orłowo (Wagner 1938, Stichel 1960). A single specimen collected in 1915 from "Stopnitza" was also listed as originating from Poland by Péricart (1998), but no-one can be sure this specimen has really been collected within the present boundaries of Poland. New to Mazovian Lowland.

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#### Streszczenie

*Emblethis denticollis* i *Heterogaster cathariae* (Hemiptera: Heteroptera) w Polsce, oraz dane o występowaniu 10 kolejnych, rzadko odławianych w Polsce gatunków pluskwiaków różnoskrzydłych

W pracy zaprezentowano dane o występowaniu 12 gatunków pluskwiaków różnoskrzydłych w Polsce. *Heterogaster cathariae* okazał się nowym dla fauny Polski, a stanowiska trzech gatunków: *Emblethis denticollis*, *Hypsoloecus visci*, *Pionosomus opacellus* są drugim znalezionymi w Polsce. Pozostałe gatunki pluskwiaków należą również do rzadko odławianych w Polsce, a ich opisane stanowiska są często pierwszymi w poszczególnych krainach zoogeograficznych.



**MATERIALS TO THE DISTRIBUTION OF PROTECTED, RARE AND ENDANGERED SPECIES  
OF INSECTS IN THE STOBRAWA LANDSCAPE PARK**

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**ABSTRACT:** Paper presents new localities of 12 species of insects, classified as protected, rare or threatened in Poland. All listed localities come from the territory of Stobrawa Landscape Park, from the years 1997-2006

**KEY WORDS:** Coleoptera, Odonata, Orthoptera, Lepidoptera, new localities

***Introduction***

Stobrawa Landscape Park was established in 2000. It covers ca. 52 000 hectares in northern part of the Opole Region (Koziarski and Makowiecki (eds.) 2000). Due to its vast area, the knowledge about animal species inhabiting various ecosystems concerns just selected groups of animals and also is much fragmented (e.g. Blaik 2004, Hebda and Kuńka 2005, Hebda and Wszyński 2000). This stage makes management of its natural resources harder and causes ineffective nature protection. Therefore informations about distribution of protected, rare and endangered species are very useful and desired.

In this paper we present new localities of 12 insect species, classified as protected, rare and threatened with extinction (see: Głowaciński 2002, European Habitat Directive..., Rozporządzenie w sprawie...). It is worth of mention that field work that revealed new localities were not systematically carried out. All presented data come from the territory of Stobrawski Landscape Park, from the last decade (1997-2006). Data are presented in systematic order.

## Results

### Odonata

#### *Ophiogomphus cecilia* (Fourcroy)

Ca. 1,5 km west from Krzywa Góra, Budkowiczanka river, river with speedy flow, sandy bottom, transparent water, 24.07.2003: 2 individuals, 28.07.2006: 2 individuals.

### Orthoptera

#### *Gryllus campestris* L.

Ładza, sandy grassland, 2003, May 2004: numerous.

#### *Oedipoda caerulea* (L.)

North from Murów, sandy grass, August 2004: numerous, copulating pairs; Ładza, sports field at the school, sandy grass, 2003: numerous, August 2004: numerous.

### Coleoptera

#### *Carabus intricatus* L.

Pokój, park at the Elizium, mixed forest (ancient forest), 30.11.2004: 1 individual behind bark of decaying spruce log.

#### *Dorcus parallelipipedus* (L.)

South from Barucice, riparian forest, 05.06.2005: 1 individual, 26.06.2005: 2 individuals on the log; south-east from Barucice, Smortawa river bank, at the forest unit No 111a, riparian thickets, 21.06.2004: 1 individual.

#### *Cerambyx cerdo* L.

South from Zawisć, isolated old oak in mixed forest, 11.12.2004: many larvas openings in the tree; north-west from Dobrzyń, old oak being a natural monument No 98, 21.07.2005: many larvas openings in the tree; Okoły, old oaks growing on the open area on the outskirts, November 2004: many larvas openings in the tree; north-east from Różyna, old oak growing at the crossroad of Różyna and Wronów, 06.07.2005: larvas openings in the tree.

#### *Liparus glabrior* Küster

South-east from Kolonia Popielowska, floodbank at the forest unit No 257b, 16.06.2005: 1 individual; south from Stobrawa, forest unit No 236, oak-hornbeam, June 2005: 1 individual.

### Lepidoptera

#### *Maculinea nausithous* (Bergsträsser)

South from Stobrawa, flood bank, meadow with *Sanguisorba officinalis*, 18.08.2001: several individuals, 05.08.2003: 1 individual, 08.08.2003: 1 male; south from Kościerzycy, the Odra River floodbank, meadow with *Sanguisorba officinalis*, 06.08.2001: several individuals; south from Czepielowice, the Odra River floodbank, meadow with *Sanguisorba officinalis*, 06.08.2001: several individuals.

***Apatura ilia* (Denis, Schiffermüller)**

South from Dąbrowa Namysłowska, fish ponds complex, deciduous forest, 02.07.1997: several; south from Barcucice, riparian forest, ancient forest, 05.07.2005: 1 individual.

***Apatura iris* (L.)**

0,75 km south from Okoły, sandy road at the forest edge, 11.07.2005: 1 individual; south from Barcucice, riparian forest, ancient forest, 01.07.2001 and 05.07.2005: 1 individual.

***Syntomis phegea* (L.)**

Ca. 2,25 km north-east from Różyna, road and edge of forest, 06.07.2005: numerous; Budkowice Stare-Wierzchowiny, thermophilous grassland at the pine forest, 28.06.2005: 1 individual; south from Barucice, mixed forest, 26.06.2005: 1 individual.

**Hymenoptera*****Bombus cryptarum* F.**

Ładza, garden, April 2005: single individuals were repeatedly observed.

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**Streszczenie**

*Materialy do rozmieszczenia chronionych, rzadkich I zagrożonych gatunków owadów  
w Stobrowskim Parku Krajobrazowym*

Artykuł prezentuje nowe stanowiska interesujących 12 gatunków owadów, które uważane są za rzadkie, zagrożone lub prawnie chronione w Polsce. Wszystkie stanowiska położone są na terenie Stobrowskiego Parku Krajobrazowego i zostały odnalezione w latach 1997 – 2006.

## CONSERVATION STATE OF TREES - NATURE MONUMENTS IN THE OPOLE CITY

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**ABSTRACT:** The aim of the paper was the presentation of the research results regarding conservation state of trees - nature monuments (24 objects) in the Opole city (the provincial capital, the south-west part of Poland). Health state estimations of monuments were based on the scale worked out by Duda (Wika and Włoch 1994).

In result of the study the following outcomes were shown:

- health state of tree monuments is good (among the analysed trees there are as many as 22 objects in good health condition and only 2 in bad);
- tree-crowns of monumental trees are more damaged than tree-trunks);
- 14 objects need conservation work, yet not urgent.

**KEY WORDS:** tree, nature monument, health state, conservation state, city, Opole.

### *Introduction*

Monumental trees have long aroused interest and in several countries they have been under legal protection for many years. In Poland these trees are protected (among other possibilities) as the element of National Natural Heritage, under the Nature Conservation Act of 16<sup>th</sup> April 2004 (Journal of Laws, no. 92, item 880).

Poland is one of the few European countries where many old trees are preserved (Pacyniak 1992). The greatest number of trees grows outside woodland, namely in field and roadside plantings, farmstead and homestead greenery, in city greenery systems, and especially in antique parks and court gardens, which however depends on a given

province (Konca 1990, Harabin 1996, Olaczek et al. 1996). Sadly the health state of these objects is worrying.

Research carried out by the author of this article - as well as analysis of the available published material - make it possible to find out that these trees are in danger due to the following factors:

- pollution;
- fluctuation of underground water levels;
- fungi and invasive insects;
- groundwork and man-made surfaces in close proximity to the trees;
- the burning of grass and tree trunks;
- a sudden change in atmospheric climate.

Notwithstanding the above-mentioned factors, bad condition of these precious trees is also influenced by:

- high cost of preservation work and lack of professionalism;
- lack of information signs and fences surrounding nature monuments;
- shortage of caretakers/guardians living close to the sites;
- little sensibility to beauty of Nature and lack of knowledge about the function of old trees in environment.

Among the enumerated factors the most significant ones in city conditions are: earthwork, soil compaction and introduction of artificial surface. In older trees the proportion of root mass and mass of above-ground parts of a tree decreases, therefore the trees react very strongly to all kinds of acts that influence the functions of the root system.

Nature monuments are subject to strict legal protection. It equals giving the monument the status of inviolability. This status is passive protection and constitutes an insufficient form of protection for trees-monuments. Uniqueness of tree monuments which are generally in advanced age, and at the same time increasingly common and strong influence of all anthropogenic burdens makes active protection of these living monuments necessary. Active protection of tree monuments is secured by the programme of preventive and therapeutic activity. The aim of this activity is to protect the trees from damage or destruction and to prolong their life maximally. Limiting to minimum potential threats which old trees cause to the surroundings is an additional, crucial objective in the city conditions (Siewniak 1988).

Generally nursing of older trees should be directed to optimise tree longevity. However natural physiological changes of trees during its aging process should also be considered. It's particularly important to remember that decaying of old, inactive parts of a tree is an inevitable biological process. Older trees are in "fragile" energetic balance and all excessive interference alters this balance and destroys natural protective system. Therefore fundamental motto of nursing of older trees should be: don't injure! Majestic old trees have a right to a hollow, gnarls etc. Decision about proper treatment should be based on broad assessment of many factors (including environmental); elimination of causes is the most effective way to improve the situation. However aim of undertaken

actions should be thoroughly analysed each time (Szczepanowska 2001).

### Methods

All tree monuments that grow within the area of Opole city were subject to research (together 24 objects). There were 4 objects among them that appear in Voivodship Nature Conservator register and 20 trees appointed with Town Council resolution.

To assess health state of the examined objects a scale proposed by Duda (tab. 1) was applied. According to the scale health of each tree is assessed in 12-grade scale (good, if sum of points for trunk and crown does not exceed 3, bad if it is between 4 and 7 and very bad if it exceeds 8). A tree injury is defined as mechanical damage of tree trunk in a form of bark and phloem stripping that reaches cambium and even deeper. Its width is measured perpendicularly to tree trunk axe in a place where right and left edges of callous tissue or injury are most separated (Wika and Włoch 1994). The results of this research are presented in a table 2.

Table 1. Health state of trees (by J. Duda).

Degree of damage	Damage size		Note
	tree-stem (S)	tree-crown (K)	
0	Not damaged cambium and phellogen	No damage	Growth of a new wood grain and phloem in a whole girth of tree
1	Single injury or several injuries together up to 10cm of girth	Up to 15% of tree crown, withered 1-2 branches or boughs girth at base exceeding 5cm	Frost cracks, mechanical injuries, unscarred cork in a trunk up to 10cm
2	Injuries of 10-25% of trunk girth	15-25%, more than 2 injured boughs	At least $\frac{3}{4}$ of trunk girth functions as a conductor in wood and phloem
3	Injuries of 25-50% of trunk girth	25-50%	Cambium functions preserved in at least $\frac{1}{2}$ of trunk girth
4	Injuries of 50-75% of trunk girth	50-75%	At least $\frac{1}{4}$ of trunk girth function as a conductor
5	Injuries more than 75% of trunk girth	More than 75%	Less than $\frac{1}{4}$ of trunk girth functions as a conductor

Source: S. Wika, W. Włoch (ed.), *Aleja Husarii Polskiej z alejami bocznymi na tle rezerwatu Łęczszak w Kotlinie Raciborskiej*, Rudy Wielkie 1994, p. 44.

### Results

*Platanus ×hispanica* ‘Acerifolia’ (11 objects) constitute the biggest group among the monumental trees that grow within the area of Opole city. There are also:

- *Quercus robur* - 5 objects;
- *Ulmus laevis* - 2 objects;

- *Fagus sylvatica*, *Fraxinus excelsior*, *Acer campestre*, *Tilia cordata*, *Ginkgo biloba* and *Liriodendron tulipifera* - 1 object of each species.

Angiosperms constitute a substantial majority, however gymnosperms are sadly represented by only one species - *Ginkgo biloba*. 13 objects represent species that do not belong to our Polish flora.

The most splendid monuments are:

- *Platanus ×hispanica* ‘Acerifolia’ at Wolności Square - 725cm of girth (at the height of 0,4m);
- *Tilia cordata* in Grotowice - 620cm of girth (at the height of. 0,5m);
- *Platanus ×hispanica* ‘Acerifolia’ in Niedziałkowski St.- 566cm of girth (at the height of 1,3m).

It can be stated that the health condition of monumental trees in the Opole City is good (among the analysed trees there are as many as 22 objects in good health condition and only 2 in bad).

*Quercus robur* in Strzelców Bytomskich St. and *Platanus ×hispanica* ‘Acerifolia’ at Niedziałkowski St. (trunk and crown without injuries) are monuments in the best condition. *Tilia cordata* in Grotowice (trunk 2nd, crown 3rd degree of damage) and *Platanus ×hispanica* ‘Acerifolia’ at Barlicki St. (trunk and crown 2nd degree of damage) are in the worst condition.

It was stated that the crowns of the analysed trees are damaged to a greater degree (2 items of K<sub>0</sub>, 15 items of K<sub>1</sub>, 5 items of K<sub>2</sub>, 2 items of K<sub>3</sub>) than the trunks (16 items of S<sub>0</sub>, 2 items of S<sub>1</sub>, 6 items of S<sub>2</sub>).

Conservation works were suggested for 14 objects, but mostly they are not urgent.

Table 2. Conservation state of tree monuments that grow within the area of Opole city.

No.	Species	Location	Girth at the height of 1,3m (cm)	Health (by J. Duda scale)	Required conservation work
1. province registration no. 291	<i>Tilia cordata</i>	Grotowice, Oświęcimska St., near Gospoda pod Złotą Koroną;	620 (at the height of 0,5m)	S <sub>2</sub> K <sub>3</sub> bad	Pruning of broken off boughs;
2. province registration no. 437	<i>Quercus robur</i>	In the park on Bolko Island, at the corner of zoo fence, near the pedestrian path;	425	S <sub>0</sub> K <sub>1</sub> good	Cutting of dried boughs and branches;



3. province registrati on no. 486	<i>Acer campestre</i>	Piastowska St., on greenery area in front of Opole Voivodship Office building;	274	S <sub>0</sub> K <sub>1</sub> good	-
4. province registrati on no. 487	<i>Fagus sylvatica</i>	20 Piastowska St., in the garden behind the building;	311 (at the height of 0,6m)	S <sub>2</sub> K <sub>1</sub> good	-
5.	<i>Ginkgo biloba</i>	5 Strzelców Bytomskich St., in the yard;	260	S <sub>0</sub> K <sub>2</sub> good	-
6.	<i>Liriodendro n tulipifera</i>	20 Piastowska St., in the garden behind the building;	260	S <sub>2</sub> K <sub>1</sub> good	-
7.	<i>Fraxinus excelsior</i>	20 Piastowska St., on the premises of the garden behind the building;	376	S <sub>1</sub> K <sub>1</sub> good	Removing of bracket fungus carpophores;
8.	<i>Ulmus laevis</i>	At the junction of Mozart St. and Żwirki and Wigury St.;	379	S <sub>0</sub> K <sub>1</sub> good	-
9.	<i>Ulmus laevis</i>	9 Oleska St., opposite the driveway to the estate;	345	S <sub>0</sub> K <sub>2</sub> good	Removing of pavement asphalt near the tree;
10.	<i>Quercus robur</i>	1 Strzelców Bytomskich St., at the playground;	425	S <sub>0</sub> K <sub>0</sub> good	Suggested fencing of the tree;
11.	<i>Quercus robur</i>	By the pond in Barlicki St.;	409	S <sub>2</sub> K <sub>1</sub> good	-
12.	<i>Quercus robur</i>	Strzelców Bytomskich St., area of the greenery near Państwowa Szkoła Muzyczna building;	400	S <sub>1</sub> K <sub>1</sub> good	Cutting of dried boughs and branches;
13.	<i>Quercus robur</i>	Pasieka Park, on the flood control dike in the vicinity of the railway viaduct;	435	S <sub>0</sub> K <sub>3</sub> good	Cutting of dried boughs and branches;
14.	<i>Platanus ×hispanica 'Acerifolia'</i>	6 Niedziałkowski St., premises of works greenery;	566	S <sub>0</sub> K <sub>0</sub> good	-

15.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	17 Piastowska St., near the building;	445	S <sub>0</sub> K <sub>1</sub> good	Systematic control of the state of damaged parts of the crown and performing in the right time (for safety reasons) necessary procedure (cutting); Repair or removal of damaged fence;
16.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	Wolności Square, municipal greenery area;	725 (at the height of 0,4m)	S <sub>2</sub> K <sub>1</sub> good	Control of state of damaged parts of the crown and performing in the right time (for safety reasons) necessary procedure (cutting); Removal of rubbish from the hollow;
17.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	Wolności Square, area of municipal greenery;	445	S <sub>0</sub> K <sub>1</sub> good	Cutting of dried boughs;
18.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	2 Barlickiego St., near the car park;	410	S <sub>2</sub> K <sub>2</sub> bad	-
19.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	2 Barlickiego St., near the car park;	409	S <sub>0</sub> K <sub>1</sub> good	-
20.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	Korfantego St., near Telekomunikacja Polska car park;	460	S <sub>0</sub> K <sub>1</sub> good	Lack of an information notice;
21.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	Lompy St., on the premises of the primary school playground;	393	S <sub>0</sub> K <sub>2</sub> good	Improving of soil structure; recommended fencing of the tree;
22.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	Lompy St., on the premises of the primary school playground;	385	S <sub>0</sub> K <sub>2</sub> good	Improving structure of soil; recommended fencing of the tree;

23.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	Lompy St., on the premises of the primary school playground;	419	S <sub>0</sub> K <sub>1</sub> good	Improving structure of soil; recommended fencing of the tree;
24.	<i>Platanus</i> × <i>hispanica</i> 'Acerifolia'	2 Odrowążów St., behind the building;	502	S <sub>0</sub> K <sub>1</sub> good	Cutting of dried boughs;

Source: own research 2006.

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### Streszczenie

#### *Stan zachowania drzew - pomników przyrody w mieście Opolu*

W artykule zaprezentowano wyniki badań, których celem było określenie stanu zdrowotnego drzew - pomników przyrody (24 obiekty) rosnących na terenie miasta Opola (stolica województwa opolskiego, południowo-zachodnia część Polski). Do oceny zdrowotności pomników wykorzystano skalę zaproponowaną przez Dudę (Wika, Włoch 1994). Wskazano również wymagane zabiegi konserwatorskie.

W efekcie przeprowadzonych badań wykazano, że:

- stan zdrowotny analizowanych drzew jest dobry (aż 22 obiekty charakteryzują się dobrą zdrowotnością i tylko 2 złą);
- korony badanych obiektów są w większym stopniu uszkodzone aniżeli pnie;
- w odniesieniu do 14 egzemplarzy wskazano wymagane zabiegi konserwatorskie, lecz w większości nie są to zabiegi pilne.

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**MATERIALS TO KNOWLEDGE OF BEETLES (COLEOPTERA: CURCULIONIDAE,  
BRUCHIDAE, CATHARIDAE) IN OPOLE REGION**

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**ABSTRACT:** The author presents new localities of seven species of beetles from three families. These species are rare or not very well known in that area. Having analyzed four case studies on the basis of historical data, the author confirmed occurrence of *Larinus sturnus* (Schall.) and *Bruchus affinis* (Fröl.) on the territory of Opole Silesia region.

**KEY WORDS:** faunistics, new data, Opole region, S Poland

Beetles fauna in Opole region has not been subject to thorough analyses so far. A new data on many species are needed, because even data on common species have not been confirmed for many years.

The author would like to thank Mrs Anna Hohol – Kilinkiewicz and Mrs Joanna Czaja as well as Mr Paweł Żyła and prof. Antoni Kuśka for handing him over some species presented below. All specimens of these species (except two specimens of *Liparus germanus* and one specimen of *Donus palumbarius* which are in the collection of prof. Kuśka presented below account for the author's collection.

## Curculionidae

### ***Mecinus janthinus* Germar, 1821**

UPPER SILESIA: Kędzierzyn Koźle - Lenartowice (CA 08); collected from swards growing in the floodbank on the Kłodnica river; 18.05.2001 – 1 ex.; leg. M. A. Mazur

The species known from six regions (Burakowski et al. 1997). From Upper Silesia recorded once by Kuśka (1999). Known in Opole region from Gogolin (submitted).

### ***Polydrusus (S.) inustus* Germar, 1824**

LOWER SILESIA: Opole (YS 01); collected from railway embankment; 2.06.1997 – 3 exx.; leg. M. Słomska.

Very rare pontic species in SW Poland, known from there only from Wrocław (probably dragged) (Mazur 2001). Its localities in Gogolin are discovered in 2005 (submitted). Site from Opole is probably destroyed, because in 1997's the locality have been washed out by great flooding.

### ***Larinus (Ph.) sturnus* (Schaller, 1783)**

LOWER SILESIA: Góraźdze (BB 80); founded on xerothermic swards on the bottom of quarry near Góraźdze; 11.06.2006 – 2 exx.; leg. J. Czaja & A. Hohol – Kilinkiewicz

In Poland known from single localities in nine regions (Knutelski 2005). Information about occurrence of that species in Lower Silesia date back to almost 100's years ago (Burakowski et al. 1993), but as it turned out, that specimen was a *Larinus brevis* (Herbst). Specimen is in a collection of Museum of Upper Silesia in Bytom (Kuśka – pers. comm.).

### ***Donus palumbarius* (Germar, 1821)**

EAST SUDETES: Biskupia Kopa (XR 77); collected from *Alium ursinum* below a hostel; 22.06.2000 – 1 ex.; leg. A. Kuśka.

A rare mountain species known from an isolated locality at Miechów (DA 37) and from a few localities in the Sudetes and the Carpathians Mountains (Wanat and Szypuła 1998). New for that region.

### ***Liparus germanus* (Linnaeus, 1758)**

EAST SUDETES: Biskupia Kopa (XR 77); found on the red tourist trail to Biskupia Kopa; 17.06.2006 – 1 ex.; leg. M. A. Mazur. Pokrzywna (XR 77); the Bystry Potok reserve; 30.05.2004 – 2 exx.; leg. A. Kuśka.

A rare (in that region) mountain species. More localities are in the West Sudetes (Burakowski et al. 1995). Feeds on the roots of *Petasites hybridus*.

## Bruchidae

***Bruchus brachialis* Fährreus, 1839**

UPPER SILESIA: Szymiszów (CA 09); founded on xerothermic sward on the bottom of quarry near Szymiszów; 21.05.2005 – 1 ex.; leg. M. A. Mazur.

Not long ago recorded only in Beskid Zachodni Mts. (Burakowski et al. 1990). Currently a border of occurrence of that species moves towards north and reaches Wrocław, Milicz and Piła (Ruta 2001). That species has not been recorded in Opole region so far.

***Bruchus affinis* Frölich, 1799**

UPPER SILESIA: Ligota Dolna (BA 99); founded on xerothermic sward on the bottom of quarry near a xerothermic nature reserve; 11.05.2005 – 1 ex.; leg. M. A. Mazur.

LOWER SILESIA: Góraźdże (BB 80); founded on xerothermic sward on the bottom of quarry near Góraźdże; 11.06. 2006 – 2 ex.; leg. J. Czaja & A. Hohol – Kilinkiewicz.

Recorded in nine regions. Until now it has not been recorded in Upper Silesia whereas in Lower Silesia in 1910 by Gerhardt (Burakowski et al. 1990).

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**Streszczenie**

Materiały do rozmieszczenia chrząszczy (Coleoptera: Curculionidae, Bruchidae, Catharidae) na Śląsku Opolskim

W pracy zaprezentowano nowe dane o występowaniu 7 gatunków chrząszczy z rodzin Curculionidae, Bruchidae i Catharidae na Śląsku Opolskim.