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POPULATION OF *EPIPACTIS PALUSTRIS* (L.) CRANTZ (ORCHIDACEAE) AND ITS PARTICIPATION IN LOCAL PLANT COMMUNITIES WITHIN THE ECOLOGICAL USELAND "KOPANINA I" IN POZNAŃ

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ABSTRACT. In the present paper a population of *Epipactis palustris* (L.) Crantz within the ecological useland "Kopanina I" in Poznań was described. Population structure of orchid and its participation in local plant communities, as well as the ecological characteristics of its site were studied. Together 4610 specimens of *E. palustris* were noted on the area of 4400 m^2. The presence of the phytocenoses of rush vegetation of the *Phragmitetea* class and significant participation of species from *Molinio-Arrhenatheretea* and *Scheuchzerio-Caricetea nigrae* classes were observed. Local flora consisted mainly of common plants nationwide, requiring moderate light and moderately warm climatic conditions, growing on the fresh and wet, alkaline or neutral, organically-mineral soils.

KEY WORDS: *Epipactis palustris* (L.) Crantz, population, site conditions, plant communities, Poznań

INTRODUCTION

The genus *Epipactis* Zinn (Orchidaceae) consists of about 30 species, with a predominantly Eurasian distribution, but also having its representatives in Norh and Central Africa and in Norh America (Szlachetko 2001). According to Pankhurst (2006) 13 species of the genus appear in Europe. However, there is a great instability in the accepted number of its species and the borders between many taxa are unclear (Squirrell et al. 2002).

Until now eight species of the *Epipactis* have been noted in Poland (Szlachetko 2001). Some of them, as *E. albensis* Nováková et Rydlo or *E. microphylla* (Ehrh.) Swartz are extremely rare, with few, declining sites in the country. On the other hand *E. palustris* (L.) Crantz belongs to the relatively often noted species of the genus, growing all over the country, but with the most numerous sites in the south. Nevertheless it is thought to be endangered or even becoming extinct in many regions of Poland (Ginące i zagrożone rośliny... 1995, Kujawa-Pawlaczyk and Pawlaczyk 2001, Czerwona księga roślin... 2002, Kącki et al. 2003) and it is included in the "Polish red list" among the taxa of vulnerable category (Zarzycki and Szeląg 1992). It is a characteristic species of lowland bogs of order *Caricetalia davallianae* and it also growths on wet meadows of alliance *Molinion*, sometimes in riparian forests of alliance *Alno-Padion*. Since, the main causes of species threat are marsh drainage and overgrowing of wet meadows with common reed or trees and shrubs, as a result of discontinuance of their use (Piękoś-Mirkowa and Mirek 2003). Additonally, too rate of agricultural use of meadows, especially during the flowering, may also negatively influence orchid health (Kowalewska 1995).

Recently, despite the regression of *E. palustris* populations growing at natural sites, the orchid has been revealed the tendency to colonize synanthropic sites, such as gravel-pits and stone-pits, drainage and roadside ditches or even dumping grounds (Mróz and Rudecki 1995, Spałek 1995, Kozik and Nabożny 2000, Wyrzykiewicz-Raszewska et al. 2001, Rostański and Michalska 2003, Nowak and Witkowska 2006).

According to Jackowiak (1993) there have been 18 sites of *E. palustris* in evidence within Poznań, but till now only seven have survived. One of them is localized in the south-western part of the city, in the valley of the Junikowski stream, but probably it does not concern

the population of *E. palustris*, growing along the eastern bank of the Baczkowski lake [within the ecological useland "Kopanina I"; compare Jackowiak (1993) and Kaniecki et al. (1993)]. For the first time the population was observed in 2004, and since then it has been monitored.

The aim of the research was to investigate the population structure of *E. palustris* and its participation in local plant communities, as well as to determine the ecological characteristic of its site within the area mentioned above, being a part of the ecological useland "Kopanina I" in the south-western part of Poznań.

STUDY AREA

The ecological useland "Kopanina I" is situated in the south-western part of Poznań, along the valley of the Junikowski stream. It comprises about 58 ha, with the system of watery clay-pits, taking up almost half of the area of the object. These ponds were excavated in the turn of XIX and XX centuries, as a result of exploitation of ceramic resources (varve loam and boulder clay; Kaniecki et al. 1993). The prevailing part of the area of the object is plane and marshy, overgrown with sedge grass meadows and reed rushes. The area is formed by terraces, consisting of fluvial sands and gravels, lying over boulder clay. The soils of the object are fertile, strongly moist, of poorly acid to alkaline reaction. Both fertile peaty-sludgy and boggy soils as well as black soils are noted here. "Kopanina I" is included among the most valuable seminatural biocenoses in Poznań and its surroundings, with many rare and protected animals and unique, in a scale of the region, moist meadows, low peat-bogs and various flora of moist and wet habitats (Kaniecki et al. 1993, Król et al. 1998, Kluza et al. 1999, Ptaszyk et al. 2002).

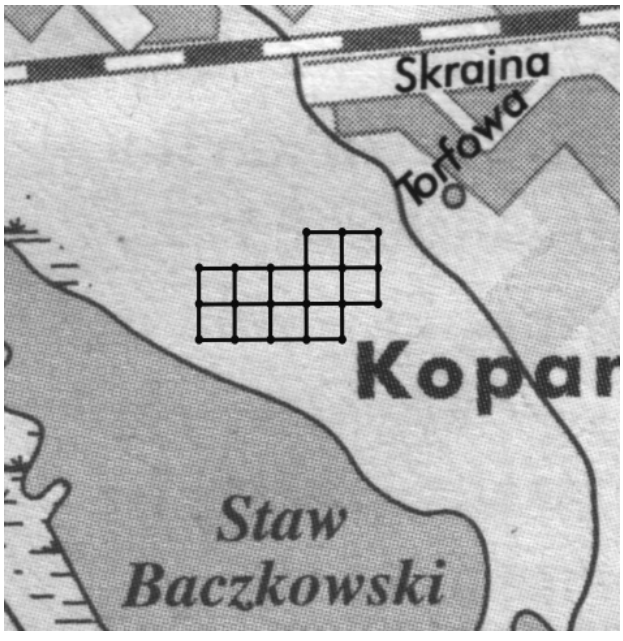

Fig. 1. The investigated area within the ecological useland "Kopanina I" in south western part of Poznań

METHODS

In July 2005 we observed a population of *E. palustris* within the mentioned ecological useland "Kopanina I". We investigated the area of 4400 m^2 (including the whole population of orchid), situated on the eastern bank of the Baczkowski Lake (Fig. 1). Using GPS we divided the area into 11 squares (dimensions of each one were 20 × 20 m; Fig. 2 and Table 1). For each plot we counted number of orchid specimens and carried out phytosociological record, using Braun-Blanquet's method. We tabulated the received data according to Matuszkiewicz's classification of plant communities (2006). The species terminology following Rutkowski (2004) was applied.

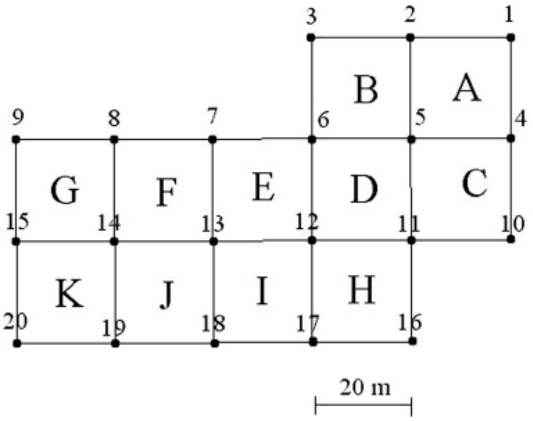

Fig. 2. The diagram of the investigated area with the division into plots

Table 1. Geographical data of the investigated area

Number of point of the plot	Longitude	Latitude
1	16°51'32.138"	52°22'38.950"
2	16°51'31.100"	52°22'38.950"
3	16°51'30.150"	52°22'39.000"
4	16°51'32.120"	52°22'38.320"
5	16°51'31.100"	52°22'38.320"
6	16°51'30.150"	52°22'38.320"
7	16°51'28.920"	52°22'38.300"
8	16°51'27.820"	52°22'38.300"
9	16°51'27.200"	52°22'38.300"
10	16°51'32.270"	52°22'37.670"
11	16°51'31.170"	52°22'37.670"
12	16°51'30.100"	52°22'37.675"
13	16°51'29.080"	52°22'37.675"
14	16°51'28.130"	52°22'37.675"
15	16°51'27.200"	52°22'37.700"
16	16°51'31.350"	52°22'37.050"
17	16°51'30.250"	52°22'37.070"
18	16°51'29.080"	52°22'37.070"
19	16°51'28.300"	52°22'37.000"
20	16°51'27.190"	52°22'37.000"

We analysed ecological properties and dynamic tendencies of the whole flora of investigated area on the basis of a study by Zarzycki et al. (2002). The following data was determined: life form, the number of stands in Poland, dynamic trends in Poland in the last decades, light index, thermal index, continental index, soil moisture index, trophic index, organic matter index, soil grain size index, soil acidity index.

RESULTS

Together 4610 specimens of *E. palustris* (Table 2) were noted. Its density population on average was about one plant per 1 m^2, but orchid distribution was not regular. It represented aggregate type of spatial distribution. As much as almost 43% of specimens was noted on plot E. For the others plots percentage of plants varied from 14% (plot D) to not more than 0.1% (plots J and K, with single plants only).

We recorded the presence of the phytocenoses of rush vegetation of the *Phragmitetea* class (Table 3). A part of the investigated area (plots F, I, J, K) was covered by *Caricetum acutiformis* Sauer 1937, with its characteristic species *Carex acutiformis*. The vegetation of the others plots also drew strong parallel to this plant community, however it grew on the more dried sites, with the great participation of meadow species from *Molinio-Arrhenatheretea* class.

The shrubby species were mainly related to the *Alnetea-glutinosae* and *Salicetea-purpurea* classes. Among them *Salix cinerea* was relatively often observed, covering up to 35% of the area of some plots.

The whole floristic composition of the investigated object was rich and diversified. Species connected with the *Molinio-Arrhenatheretea* class were represented in the biggest number. Both they were typical for the arable land (e.g. *Poa pratensis*, *P. trivialis*, *Lathyrus pratensis*, *Lotus corniculatus*, *Dactylis glomerata*) and for the riverside herbs (e.g. *Angelica sylvestris*, *Cirsium palustre*,

Table 2. Participation of *E. palustris* specimens within the investigated plots, its density and the number of the other species on the plot

Plot sign	A	B	C	D	E	F	G	H	I	J	K
Number of orchid specimens	548	497	120	643	1 972	281	221	114	204	4	6
Percentage participation of orchid in its population	11.9	10.8	2.6	13.9	42.8	6.1	4.8	2.5	4.4	0.1	0.1
Orchid density	1.37	1.24	0.30	1.61	4.93	0.70	0.55	0.28	0.51	0.01	0.01
Number of the other species on the plot	43	53	37	42	50	33	26	36	44	35	41

Table 3. Vegetation with the participation of *E. palustris* within ecological useland "Kopanina I"

Number of record	1	2	3	4	5	6	7	8	9	10	11	Constancy	Cover coefficient
Number of plot	A	D	E	B	H	C	G	I	F	K	J		
Date	6.07. 05	6.07. 05	6.07. 05	6.07. 05	6.07. 05	6.07. 05	7.07. 05	7.07. 05	7.07. 05	7.07. 05	7.07. 05		
Tree layer a (%)	.	.	.	5	.	.	.	.	.	.	.		
Shrub layer b (%)	5	5	5	10	.	5	15	15	35	10	10		
Herb layer c_1 (%)	80	90	40	70	70	95	100	90	90	100	100		
Herb layer c_2 (%)	100	100	100	100	95	100	100	100	100	100	100		
Number of species	44	43	51	54	37	38	27	45	34	42	36		
I. ChCl. *Scheuchzerio-Caricetea nigrae* et *Caricetalia davallianae**													
Carex nigra	4	2	2	3	2	1	2	1	1	+	.	V	1 683
*Epipactis palustris**	2	3	3	2	2	2	1	2	2	+	+	V	1 684
*Carex flava**	1	2	+	+	1	+	1	1	.	+	.	V	345
Juncus articulatus	+	+	r	.	.	.	.	.	.	.	.	II	3
II. ChCl. *Molinio-Arrhenatheretea* and ChO. *Molinietalia**													
*Equisetum palustre**	2	2	2	2	+	2	1	2	2	2	4	V	1 887
*Cirsium palustre**	r	2	+	1	+	+	1	1	2	1	+	V	505
Galium mollugo	2	2	2	2	2	2	+	1	2	+	2	V	1 320
Geranium pratense	+	1	1	+	2	+	.	r	+	+	1	V	301

Number of record	1	2	3	4	5	6	7	8	9	10	11	Constancy	Cover coefficient
Ranunculus acris	.	1	1	+	+	2	1	.	+	2	2	V	616
Rhinanthus angustifolius	+	r	.	1	+	1	r	+	.	.	+	IV	96
Trifolium pratense	+	.	+	r	+	+	.	r	.	+	+	IV	7
Vicia cracca	+	+	+	+	+	.	.	+	.	.	+	IV	6
*Prunella vulgaris**	+	+	+	+	r	+	.	+	.	.	.	IV	6
*Juncus effusus**	+	+	r	+	+	+	+	.	.	+	.	IV	7
Leontodon hispidus	+	2	1	1	.	2	.	r	.	.	.	III	411
Lathyrus pratensis	.	.	.	1	.	.	2	2	.	2	+	III	524
Centaurea jacea	.	.	+	.	+	r	r	+	.	.	.	III	5
*Briza media**	2	1	+	2	2	2	.	.	.	.	.	III	683
Achillea millefolium	+	2	1	+	.	.	.	.	+	.	+	III	208
Dactylis glomerata	.	+	+	+	+	.	.	.	.	.	r	III	5
Daucus carota	.	+	+	+	+	1	.	.	r	.	.	III	50
Lotus corniculatus	5	+	+	+	+	1	.	.	.	.	.	III	845
*Galium uliginosum**	.	.	.	.	.	.	+	+	.	+	+	II	4
*Deschampsia caespitosa**	.	+	.	.	r	.	r	+	.	.	.	II	4
*Angelica sylvestris**	.	.	.	.	.	.	.	+	.	1	+	II	47
Potentilla reptans	.	+	r	.	.	.	.	+	1	.	.	II	48
Trifolium repens	.	.	.	+	+	.	.	.	.	r	.	II	3
*Lysimachia vulgaris**	+	.	.	.	.	.	.	+	.	.	+	II	3
*Cirsium oleraceum**	.	.	r	.	.	.	.	.	.	+	+	II	3
Taraxacum officinale	+	.	.	r	.	+	.	.	r	.	.	II	4
Arrhenatherum elatius	.	.	.	+	1	.	+	.	.	+	.	II	48
III. ChCl. *Phragmitetea* and ChAss. *Phragmitetum autralis**													
*Phragmites australis**	4	3	3	3	3	4	2	5	5	5	5	V	5 841
Glyceria maxima	+	+	.	.	.	+	+	.	.	+	.	III	5
Equisetum limosum	.	.	.	.	.	.	.	.	+	+	r	II	3
ChAll. *Magnocaricion*													
Phalaris arundinacea	2	2	2	3	3	3	5	3	+	3	2	V	3 137
Carex acutiformis	.	.	.	.	.	.	.	2	2	2	4	II	1 045
IV. ChCl./O./All. *Alnetea glutinosae*													
Salix cinerea b	1	+	+	2	.	.	2	2	3	2	2	V	1 184
Lycopus europaeus	+	.	.	r	.	.	.	+	r	+	.	III	5
V. ChCl. *Artemisietea vulgaris*													
Betula pendula a/b	./+	./+	./1	1/.	.	./+	./+	./+	./+	.	./+	V	97
Rubus caesius	+	+	.	+	2	1	.	1	r	+	+	V	255
Eupatorium cannabinum	+	2	+	+	+	.	2	2	2	2	2	V	958
Melilotus officinalis	.	.	+	+	.	.	+	2	.	+	+	III	164
Epilobium hirsutum	.	.	r	.	.	.	+	+	+	1	+	III	50
Calystegia sepium	+	.	.	+	.	.	.	+	.	.	+	II	4
Carduus crispus	.	.	.	.	r	.	+	.	.	+	+	II	4
Melilotus alba	+	.	+	+	.	2	.	.	.	.	.	II	162
VI. ChCl. *Festuco-Brometea*													
Ononis spinosa	+	+	+	2	2	1	.	1	.	+	.	IV	413
Plantago media	.	.	r	.	+	.	.	+	.	r	.	II	4
Asparagus officinalis	r	+	.	+	+	.	.	.	.	.	.	II	4
Eryngium campestre	.	r	+	.	.	+	.	.	.	.	.	II	3

Number of record	1	2	3	4	5	6	7	8	9	10	11	Constancy	Cover coefficient
VII. Others													
Salix purpurea b/c_1	./+	.	+/.	./r	.	.	+/.	./+	2/.	+/.	.	IV	165
Agrostis capillaris	2	1	.	+	1	+	.	+	.	+	.	IV	254
Dactylorhiza incarnata	.	2	r	r	.	r	.	.	r	.	.	III	163
Erigeron acer	+	+	+	+	r	+	.	.	.	.	.	III	5
Mentha aquatica	+	.	+	.	.	.	.	+	+	+	+	III	5
Hypericum maculatum	.	.	+	.	.	.	+	+	+	+	r	III	5
Polygala vulgaris	.	+	+	+	+	+	.	.	.	.	.	III	5
Sonchus oleraceus	.	.	r	.	+	+	.	r	.	.	r	III	5
Holcus mollis	.	+	+	+	.	.	.	+	.	+	.	III	5
Berula erecta	.	.	.	.	.	.	2	1	2	2	.	II	523
Agrimonia eupatoria	+	+	.	+	+	.	.	.	.	.	.	II	4
Campanula rapunculus	+	+	+	+	.	.	.	.	.	.	.	II	4
Juncus macer	+	+	+	.	.	.	.	.	.	r	.	II	4
Tussilago farfara	.	r	.	r	.	.	.	.	+	+	.	II	4
Juglans regia c_1/c_2	./r	.	.	r/.	.	r/.	.	.	.	.	.	II	4
Melandrium rubrum	r	.	r	.	.	.	.	r	.	.	+	II	3
Crataegus monogyna b/c_1	.	.	.	./r	.	.	+/.	.	./r	.	.	II	3

I. *Carex stellulata* 9(r), 10(+); *Parnassia palustris** 2(r), 4(r).
II. *Poa trivialis* 3(+), 4(2); *Ranunculus repens* 8(2), 10(r); *Valeriana officinalis* 4(+), 10(r); *Potentilla anserina* 1(+), 9(r); *Trifolium dubium* 3(r), 6(r); *Molinia caerulea** 8(+); *Euphrasia rostkoviana** 4(+); *Tragopogon pratensis* 1(+); *Veronica chamaedrys* 1(+); *Crepis biennis* 3(r); *Epilobium palustre** 8(r); *Poa pratensis** 8(r).
IV. *Salix aurita* b/c 2(+/.), 3(./+); *S. rosmarinifolia* c 9(+); *Thelypteris palustris* 10(+), 11(+); *Solanum dulcamara* 8(r).
V. *Populus tremula** c_1 3(r), 11(+); *Cichorium intybus* 4(r), 6(r); *Salix caprea* c_1 3(r).
VI. *Carex caryophyllea* 9(+); *Euphorbia cyparissias* 6(1).
VII. *Carex flacca* 10(+), 11(+); *Allium scorodoprasum* 4(r), 5(r); *Hypericum perforatum* 4(r), 5(+); *Coronilla varia* 4(+); *Hieracium pilosella* 6(+); *Scabiosa canscens* 6(+); *Arenaria serpyllifolia* 1(+); *Cornus sanguinea* c_1 11(r); *Festuca ovina* 6(r); *Populus alba* $c_1$9(r); *Rhamnus catharticus* $c_1$2(r); *Rosa canina* $c_2$3(r); *Viburnum opulus* $c_1$5(r).

Deschampsia cespitosa, *Equisetum palustre*, *Galium uliginosum*).

Though there were only some species closely connected with *Phragmitetea* and *Scheuchzerio-Caricetea nigrae* classes, they were of the greatest importance in the phytocenosis structure. Besides, simultaneous presence of the species of *Caricetalia nigrae* and *Caricetalia davallianae* orders (both from *Scheuchzerio-Caricetea nigrae* class) indicated differentiation of the reaction of subsoil. The participation of plants, growing on the more dry sites, as ruderal or grassland species, were also noted (plants from *Artemisietea vulgaris*, *Festuco-Brometea* and *Rhamno-Prunetea* classes).

The analysis of the relationship between the orchid density and the number of the other species showed that both values were positively correlated (Table 2). In general high number of orchids was connected with high number of the other taxa. Within 101 recorded species *E. palustris* was always accompanied with *Cirsium palustre*, *Equisetum palustre*, *Galium mollugo*, *Phalaris arundinacea* and *Phragmites australis*. Besides, it grew very often together with *Betula pendula*, *Carex flava*, *C. nigra*, *Cirsium palustre*, *Equisetum palustre*, *Eupatorium cannabinum*, *Geranium pratense*, *Juncus effusus*, *Prunella vulgaris*, *Ranunculus acris*, *Rhinanthus angustifolium*, *Rubus caesius*, *Salix cinerea*, *Trifolium pratense* and *Vicia cracca*.

The most abundant life forms according to the Raunkiaer system were hemicryptophytes (54.5% of flora). Small groups were composed by geophytes (14.6%) and phanerophytes (13.5%), followed by therophytes (6.3%) and hydrophytes (5.7%); while representatives of the rest life-forms were found rarely (chamephytes – 2.2%, lianas – 1.6%, semiparasites – 1.6%).

The flora of the investigated object consisted mostly of common species nationwide (63%) or species with a large number of stands in many regions of Poland (32%). Only five species had a small number of stands (*Allium scorodoprasum* and *Eryngium campestre*) or large number, but primarily in one region (*Festuca ovina*, *Ononis spinosa* and *Scabiosa canescens*). At the same time majority of the noted species exhibited high dynamics throughout the country, with an increase in the number of stands, with a marked increase in specimens in individual stands. In turn, populations of eight species (*Briza media*, *Carex flava*, *Dactylorhiza incarnata*, *Equisetum limosum*, *Eryngium campestre*, *Parrnasia palustris*, *Populus alba* and *Scabiosa canescens*) were found to regress.

The most numerous group in the analysed object consisted of species preferring full or moderate light.

Only five species were classified as plants living in semi-shade (*Calystegia sepium*, *Lycopus europaeus*, *Melandrium rubrum*, *Populus tremula*, *Viburnum opulus*). The thermal index indicated in local communities of investigated area the highest share of species preffering moderately warm climatic conditions. Besides, two species (*Eryngium campestre* and *Scabiosa canescens*) required the warmest microhabitats. Almost all flora appeared to be neutral to continental climate. Only one subcontinental taxon (*Crepis biennis*) and one subatlantic (*Scabiosa canescens*) were noted.

The species connected with fresh and moist soils prevailed. Sites extreme in terms of moisture content conditions were occupied by 10 species living in water and 12 species growing on dry soils. In terms of the trophic index species of meso- and eutrophic soils predominated (40% and 51% flora, respectively). While analysing the organic matter index the highest share was found for species growing on mineral-humus soils (67% flora), followed by those growing on soils rich in humus (26%) and much less often – on soils poor in organic matter (7%). The trophic index and the organic matter index were positively correlated with the soil grain size index, for which the biggest number was recorded of species connected with sandy loams and silty soils (51%) and less frequently with heavy loams and clays (22%) and with sands (18%). 50% species of the analysed object in order to develop require a neutral reaction of subsoil, less often alkaline (31%) or moderately acid (16%).

DISCUSSION AND CONCLUSION

Matuszkiewicz (2006) includes *E. palustris* among the characteristic species for the *Caricetalia davallianae* order. According to Piękoś-Mirkowa and Mirek (2003) it may also occur in the molinion meadows from *Molinion* alliance. In the region of Poznań Wyrzykiewicz-Raszewska et al. (2001) described anthropogenic site of these orchids overgrowing by the phytocenosis of *Galio borealis-Molinietum* (Libbert 1932) Philippi 1960, while Antkowiak and Pankros (2000) characterized natural site of the plant covering by the *Molinietum medioeuropaeum* W. Koch 1926 association. Within the investigated area of "Kopanina I" we also noted many species from *Molinio-Arrhenatheretea* class. However, the phytocenoses of object were the most strongly connected with *Phragmitetea* class and a part of area with *E. palustris* was overgrown by a typical form of *Caricetum acutiformis*. Besides, we also noted the participation of species from *Scheuchzerio-Caricetea nigrae* class.

According to Piękoś-Mirkowa and Mirek (2003) population of *E. palustris* on the natural site usually numbers from several to several dozen specimen. Then Wyrzykiewicz-Raszewska (2001, 2002) valued the orchid population growing on anthropogenic site whithin the Poznań agglomeration on even 100 000 individuals, with mean density 77 plants per 1 m^2. According to Adamowski and Conti (1991) the expansion of orchid species is stimulated by open area or by disturbance of soil conditions. Such orchid density had not been observed on natural sites (Wyrzykiewicz-Raszewska 2001, 2002). Within "Kopanina I" we noted together 4610 specimens, but on average there was only one plant per 1 m^2, with the maximal orchid density up to five plants per 1 m^2.

Prochazka and Velisek (1983) consider *E. palustris* to be a photophilous plant, however it may completely develop in partial shading. They also determine for orchid pH value in the range 6.5-8.5. According to Piękoś-Mirkowa and Mirek (2003) the orchid prefers wet, eutrophic soils, abundant in calcium carbonate. Antkowiak and Pankros (2000) pay attention to the high content of magnesium in soil substratum. *Epipactis palustris* usually grows on the hydromorphic and semihydromorphic soils, as peat (originated from lowmoor or transitional moron), silty, half-bog, black and groundgley soils. Sometimes it is also noted on the limstone soils (Piękoś-Mirkowa and Mirek 2003). Our analysis of dynamics and site index of vascular flora (basing on Zarzycki et al. 2002) revealed within investigating phytocenoses with this orchid, superiority of common plants nationwide, requiring moderate light and moderately warm climatic conditions, growing on the fresh and wet, alkaline or neutral, organically-mineral soils.

Though the local site conditions of "Kopanina I" seems to be optimal for marsh helleborine, its population is in danger of being exterminated. A main threat results from the strong, uncontrolled anthropopressure. Every year the dumping grounds of garbages and of waste building material have been observed. Besides, the object is a place of rest of inhabitants of neighbouring housing estates, who tread all possible crosses as walking paths or ways for two-wheeled vehicles and used the area of object for aestivals bivacous, baths and positions for anglers (Kluza et al. 1999). The condition of this orchid population significantly depends on environmental protection too. Entire desistance from use of the area (e.g. of mowing as the method of eliminating trees and shrubs) as well as intensification of its use (e.g. of often mowing or excessive grazing of domestic animals) would negatively influence the species. So further existence of *E. palustris* within "Kopanina I" depends on preservation of its ecosystem and limitation of human activity.

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