1 Introduction

Urban ecology has a long history and the field has been rapidly developing in the last decades (e.g. Sukopp 2002). Currently it belongs to one of the hot topics of contemporary ecological research. In this paper we focus on a settlement flora, namely villages. If there was one word describing urban flora, it would be its extraordinary diversity. There are no two villages, towns or cities with identical floristic and/or vegetation composition. Two foremost factors determining the environment of human settlements are (i) abiotic conditions and surrounding landscape and (ii) dynamic influence of people and their activities. It has long been recognized that human settlements represent extraordinary species-rich environment (Sukopp & Werner 1983). On a regional scale, Walters (1970) was the first to acknowledge that human settlements harbour more spontaneous plant species than surrounding landscape, a finding that has been later confirmed by many other authors (e.g., Deutschwitz & al. 2003, Klotz 1990, Kowarik 1990, Kühn & al. 2004, Pyšek 1992, Pyšek 1993).

Urban ecosystems differ from the landscape in which they are embedded in number of man-induced factors, including frequent disturbances due to building industry, increased level of diaspore import enhancing probability of immigration of new taxa, or higher nutrient content (e.g. Pyšek 1989a, Sukopp 2004, Sukopp & Werner 1983). Urban areas are not ecologically homogenous; it is rather a mosaic of different habitat types dependent on a small scale distribution of land uses (Sukopp 1998). Interactions of many contributing factors result not only in a heterogeneous mosaic of habitat types within urban structures but also, at a larger scale, in a spatial mosaic of various settlements within a certain geographic area.

In Central Europe, where man-made or man-influenced habitats prevail over the natural ones, urban agglomerations have been playing an important role for centuries (Kowarik 1990). Studies of urban flora and factors that influence diversity and species composition are therefore highly relevant. Over the past two decades numerous studies investigated flora and vegetation of human settlements on a variety of scales: (i) larger cities such as Rome (Celesti-Grapov & al. 2006), Berlin (Zerbe & al. 2003), Plzeň (Chocholoušková & Pyšek 2003), five Italian cities (Celesti-Grapov & al. 1998), fifty-four European cities (Pyšek 1998b) and German cities (Kühn 2004); (ii) small-scale studies such as Kokořínsko Protected Area (Mahelka & al. 2002), and Bohemian Karst Protected Area (Pyšek 1985, Mandák & Pyšek 1997, aliens only) and Blanský les Protected Area (Kolář & al. 2007); (iii) several studies were also dealing with urban flora on a regional scale, e.g. Wania & al. (2006) in Central Germany and Deutschwitz & al. (2003) in Eastern Germany.

One of the ubiquitous trends valid for urban flora in general is that the species diversity is positively correlated with the settlement size, expressed both as the number of inhabitants and/or the settlement area (e.g. Klotz 1990, Pyšek 1989a). The former variable can be considered a measure of intensity of human impact resulting in variety of habitats whereas the latter is reflecting an increase of species diversity due to a rapid increase in habitat heterogeneity with the settlement size (Pyšek 1993). The number of species is furthermore increased by transport and trade activities that enhance probability of immigration of new species (Kowarik 1990, Pyšek 1989a, Sukopp & Werner 1983). Pyšek (1993) showed that the city size is also positively correlated with density (partial correlation coefficient r = 0.54), which has been previously identified by Klotz (1990) in the study of 13 European settlements as a useful means for characterizing the settlement structure.

From abiotic conditions, mean altitude and affiliated climatic factors such as average temperature and annual precipitation, as well as several geology-related factors, were reported to have a major impact on urban flora diversity and composition (Kühn & al. 2004, Pyšek 1989b, Pyšek 1998b). It is a relationship valid not only for the settlements: for example Pyšek & al. (2002a) revealed the same relationship in his study of 302 protected nature reserves in the Czech Republic and Lososová & al. (2004) reported the same result for weed communities in the Czech republic. However, natural ecological conditions can be, especially in case of larger towns and cities, modified or even outweighed by the land use in the area (Sukopp 1998) and human-induced characters can then result in altering the primary climatic conditions into that of 'urban heat island' (Sukopp & Werner 1983). Human activity is thus undoubtedly one of the crucial factors determining the main properties and dynamics of urban flora and vegetation (Pyšek & Pyšek 1990).

An important part while studying urban flora is a share of alien species, especially neophytes. Not only the number, but also the relative contribution of neophytes on the flora have been proved to increase with the settlement size. On the other hand, the overall number of alien species has been discovered to decrease with increasing altitude (which is mainly due to diminishing proportion of neophytes on a gradient from lowlands to mountainous areas), reflecting the origin of aliens in warmer areas Pyšek (1998b).

Most of the urban flora studies focused on larger towns and cities. However, the flora and vegetation of villages are somewhat different from that of towns for number of reasons such as private keeping of domestic animals, presence of habitats related to agricultural production, presence of specific moist habitats (e.g. village-green ponds, brooks, narrow shady spaces in between neighbouring houses) and, last but not least, the contact with the surrounding semi-natural vegetation at the periphery of villages (Pyšek & Pyšek 1990). For analyses of the flora and vegetation of villages are scarcer than those focusing on towns or larger cities, this study has been designed to partly fill the gap.

First studies of village flora were mostly simple floristic surveys and/or vegetation and habitat classifications (e.g. Pyšek & Pyšek 1988, Pyšek & Rydlo 1984). Only a small number of recent studies focused on revealing the environmental factors that determine diversity and composition of village floras. Pyšek (1993) in a study of 85 European villages revealed a linear increase of the species number with both the number of inhabitants and the number of houses, although the correlation was weaker than in the case of cities. Other characters proven to play an important role were climatic factors (mainly average annual temperature which is negatively correlated with altitude). On the Central European level, Ahrns (2009) investigated 56 villages in eight different regions in the central and northern Germany and in the warm parts of the Czech Republic. Climatic factors have proven to be the most important. While also examining other factors such as mean annual temperature and precipitation, geological subsoils, base presence, and number of inhabitants as a factor representing human impact on the village flora, Ahrns concluded that natural factors determine the composition of Central European village floras despite all human influence. Based on that analysis he proposed determining the degree of suburbanization as the next step and suggestted further examination of variables describing inner village structure such as a degree of seal and proportion of agricultural structures within the settled area.

Comparison of alien and native species in the Central European urban floras has shown that alien species constitute on average of one third of all species present in the village flora, with archaeophytes contributing slightly more than neophytes (Pyšek 1998b). This is most likely caused by the species migration history: while the majority of the present day neophytic flora spread best in cities or in peculiar habitats connected with transportation activities (i.e. railway stations, river docks), many archaeophytes that immigrated as crop-field weeds spread best in rural areas (Sukopp & Werner 1983). Two main factors affecting the proportion of alien species on a regional scale (37 villages in the Czech Republic) were climatic conditions (Ellenberg indicator values for temperature were used; the temperature was negatively correlated with altitude) and anthropic pressure – human activity along with possibility of species immigration (Pyšek 1989b). The number of species in each category of immigration status increased with settlement size and decreased with increasing altitude, whereas the number of native species was not correlated with either factor (Pyšek 1998a).

Villages harbour unique flora and vegetation different from that of larger towns and cities. However, the village flora is increasingly threatened by growing urbanization (e.g. Ahrns 2009) and other processes and is therefore worth studying. In the last decades the environment of villages has changed profusely and at present the changes are more rapid. The structure of villages has become more unified and similar to that of small towns due to gradual process of urbanization and increase of building activity in this period. Modernization of agricultural production as well as abandonment of private keeping of domestic animals caused many plant taxa of ‘traditional’ villages (mainly archaeophytes, Pyšek & al. 2002b) to become rare, threatened or even extinct in some places. Nowadays some of them are included in regional and national Red lists, the examples include *Anthemis cotula*, *Chenopodium murale*, *Chenopodium urbicum*, *Chenopodium vulvaria* (Chán 1999, Hohla & al. 2009, Holub & Procházka 2000, Korneck & al. 1996, Procházka & Štech 2002, Scheuerer & Ahlmer 2003).

Unlike regional studies of village flora where altitude and correlated climatic factors explain most variability in the data, the main focus of our study was on revealing effect of set of variables describing human impact, environment and inner structure of villages. The research has been conducted in South Bohemia where well preserved 'traditional' villages are present up to this date. Based on a representative dataset of 131 villages distributed along a continuous altitudinal gradient within one relatively homogenous area, we aimed to separate the effects of abiotic factors (esp. altitude and altitude-related climatic factors) from the effects of village structure and human impact.

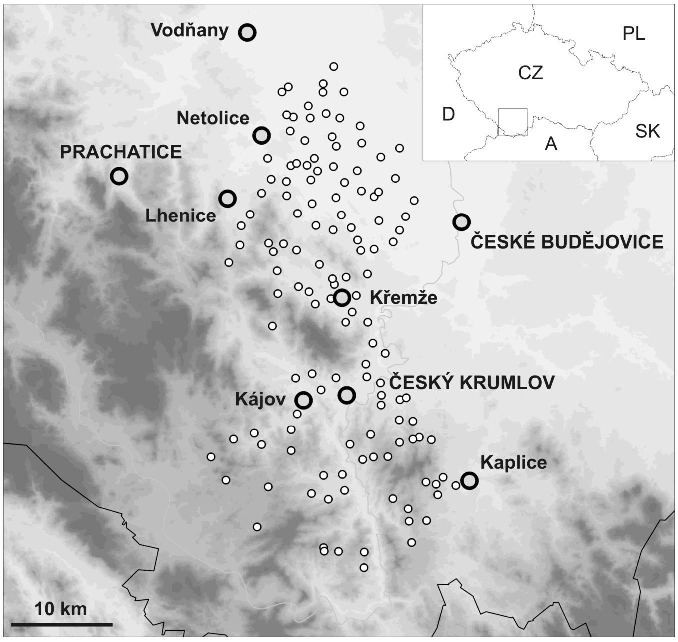

Fig.1 – Map of the study area. Shading indicates altitude (light grey – lowlands, dark grey – higher altitude). Large circles – towns (for reference), small circles – studied villages.

2 Methods

2.1 Study area

The study was conducted in southern part of the Czech Republic. In total 131 villages with ca 10 to 1000 inhabitants were studied, covering altitudinal gradient from relatively flat and warm area of Budějovická pánev Basin (henceforth referred to as the Basin) to comparatively cold and hilly foothills of Šumava Mts. (the Foothills) (Fig.1). The altitudes ranged from 380 to 820 m a.s.l. The annual average temperature ranges from 7.8°C in the Basin to 6.9°C in the mountainous region (4.8°C on the highest peak of the region, Mt. Kleť). The average annual rainfall in vegetation period increases from 350 mm in the Basin to 600 mm in the Foothills (Vesecký 1961). The climatic gradient is reflected in land use types, from intensive agriculture in the more densely populated Basin to much less intensive agricultural use and sparser habitation in the colder Foothills.

Tab.1 – Semi-quantitative scale of abundances of taxa in the studied villages.

Degrees	Abundance
1.	rare
2.	scarce
3.	common
4.	frequent
5.	dominant

2.2 Field sampling

Data were gathered in 40 villages in 2003 within a pilot study (Kolář & al. 2007) and in 91 villages in 2008–2009. The data were collected in August and beginning of September when the ruderal vegetation is optimally developed, over a short period of about three weeks to prevent phenological differences between individual villages. All spontaneously growing vascular plants including garden weeds and cultivation escapees were recorded in each village. Taxa occurring only in specific water habitats within a village (ponds, brooks, etc.) were recorded separately and were not included in statistical analyses. Obviously cultivated plants and woody taxa, in which we were not able to distinguish spontaneous occurrence from cultivation, were omitted. The only exceptions were the invasive taxa *Robinia pseudacacia* and *Rhus hirta*, if young spreading individuals were found. The area of a village was defined as the strongly human-influenced built-up zone, i.e. an imagined polygon covering the compactly settled area of a village bordered by walls of peripheral dwelling houses, outer garden fences or traffic roads in most cases. Large agricultural areas adjacent to some villages (former "(Unified) Agricultural Cooperatives") were not sampled. Abundance of each taxon was recorded using an ordinal scale (Tab. 1). However, since the scale changed considerably between the pilot study in 2003 and other two sampling years, all statistical analyses of the complete dataset are based on presence/absence data only. Voucher specimens are deposited in CBFS. Nomenclature of vascular plants follows Kubát & al. (2002).

2.3 Environmental variables

A set of eighteen environmental variables was recorded for each village (Tab. 2). Three variables describe abiotic conditions and the village surroundings (altitude and land use in the surrounding of the villages). In contrast with some other studies, we omitted geological (sub-soil) characteristics, because they are generally uniform throughout the study area. Further fifteen variables describe inner structure of the villages and direct human impact (e.g., area and density of habitation, village type, estimation of build-up area and soil use types within villages, presence of special sites, estimation of number of livestock bred in households).

Tab. 2 – Environmental variables in sampled villages with brief descriptions, units and transformations used.

Env. variable	Description	Unit	Transformation
Abiotic conditions + surroundings			
Altitude	altitude	meters a.s.l.	no
Wood_per	percentage of forested area in the surroundings	%	log(x)
Open_per	percentage of non-forested area in the surroundings	%	log(x)
Structure of the village + human impact			
logArea	village area	ha	log(x)
logDens	no. of houses / area of village	N / ha	log(x)
Vil_type	village type (0 – center-based; 1 – long and scattered)		no
Main_road	main road (0 – absent; 1 – present)		no
AbandHou	no. of abandoned houses	N	log(10*x+1)
Bld_sites	no. of building sites	N	log(10*x+1)
Pbuild	percentage of roads and build-up areas	%	log(x+1)
Plawns	percentage of lawns	%	log(x+1)
Paband	percentage of abandoned area	%	log(x+1)
Pcultiv	percentage of cultivated ground	%	log(x+1)
Pwater	percentage of water	%	log(x+1)
Poultry	no. of houses or gardens where poultry is kept	N	log(10*x+1)
Cattle	no. of stables or yards where cattle is kept	N	log(10*x+1)
Horses	no. of stables or yards where horses are kept	N	log(10*x+1)
Sheep and Goat	no. of stables or yards where sheep and goats are kept	N	log(10*x+1)

2.4 Classification of taxa

For all taxa listed, information on geographic origin (native/alien) and time of immigration (archeophytes vs. neophytes) was extracted from the list of alien plants of the Czech Republic (Pyšek & al. 2002b). Following a scheme based on invaders ability to establish and maintain viable populations outside the area of their origin (as proposed by Richardson & al. 2000 and adopted by Pyšek & al. 2002b), three categories of invasive status in alien taxa are distinguished: casual, naturalized and invasive. Some taxa (*Aquilegia vulgaris*, *Aurinia saxatilis*, *Geranium pratense*, *Hieracium aurantiacum*, *Melilotus altissimus*, *Nymphoides peltata* and *Puccinellia distans*) that are native to the Czech Republic but are not native in the studied area based on Flora of the Czech Republic (Hejný & Slavík 1988, 1990, 1992, Slavík 1995, 1997, 2000, Slavík & Štěpánková 2004, Štěpánková 2010) and authors' experience, were additionally classified as neophytes. Most of these taxa are cultivated in villages for ornamental or medicinal purposes and casually escape from cultivation. Information on threatened taxa follows the Red list of the flora of the Czech Republic (Holub & Procházka 2000) and the regional Red list of South Bohemia (Chán & al. 1999).

2.5 Statistical analyses

The list of taxa was revised for the purpose of statistical analyses. Some taxa were merged since their determination to species level was not always possible (sterile or damaged individuals or groups with unresolved taxonomy). They include the genera *Arctium*, *Fumaria*, *Mentha*, *Oenothera* and *Verbascum* and the complexes of *Chenopodium album* agg. and *Solanum nigrum* agg. Abundance of the merged taxa equals sum of abundances of individual taxa corrected to correspond with the five grade scale. Taxa occurring only in specific aquatic habitats were recorded separately in the field and were omitted from all statistical analyses since these habitats were not present in all villages.

For multivariate analyses of species composition, rare taxa with less than five occurrences in the entire dataset were excluded. The final dataset for the analyses included 366 taxa. Since data on species abundance were not available from the pilot study in 2003, a new matrix based on presence/absence only was produced for the pooled data from all sampling years. Environmental variables were normalized in all multivariate analyses.

The numbers of species, all species and by species groups (1) native and alien and (2) archaeophytes and neophytes (3) invasive species, were analysed using Redundancy Analysis (RDA) with number of taxa per village as the dependent variable („species data“ in CANOCO terminology) and the set of eighteen environmental factors as the explanatory variables. Forward selection of environmental variables was employed. In this stepwise procedure the environmental variables are added one at a time to the model, until no other variables significantly explain the residual variation. Significance of each factor is tested using a permutation test. The data were analysed using CANOCO 4.5 software (ter Braak & Šmilauer 2002). We have also considered the using a general linear model while analyzing this type of data, but due to significant differences in number of species among individual villages and unclear expected data distribution, we opted for non-parametric method with Monte-Carlo permutation test instead.

Variation of species composition among individual villages was rather small (length of gradient in detrended correspondence analysis (DCA) about 1 s.d. unit). Relationships between species composition and environmental characteristics were therefore analyzed using linear ordination methods (Lepš & Šmilauer 2003). At first, Principal Component Analysis (PCA) based on covariance matrix was employed to get a general overview of the data structure. To test the effect of environmental variables on flora composition, Redundancy Analysis (RDA) with forward selection was performed. Using a Monte-Carlo permutation procedure, marginal effects of all eighteen environmental variables were tested (999 permutations each; Bonferroni correction used to adjust the significance level to $\alpha = 0.05/18$).
All multivariate analyses were computed (i) for the whole dataset of 131 villages with presence/absence data and (ii) for the datasets from years 2008 and 2009 with data on species abundances. Separate analyses of the latter two datasets with binary data were also performed and correlation of ordination scores with abundance data was calculated to evaluate the potential loss of information when species abundances are omitted.

3 Results

3.1 Species diversity

Our study of 131 villages yielded a total of 27.773 floristic records. In total, 585 taxa (species and subspecies) of vascular plants were recorded, from which 548 taxa were further included in the following analyses (taxa occurring only in aquatic habitats and several taxonomically difficult complexes were omitted, see Methods for details). According to the Catalogue of alien plants of the Czech Republic (Pyšek & al. 2002b), 320 taxa (58.4%) were classified as native and 228 (41.6%) as non-native. The most frequent category of invasive status of alien taxa in this study was naturalized aliens (Tab. 3). Fifty-one taxa (9.3%) are listed as invasive in Pyšek & al. (2002b); this number includes 16 archaeophytes and 35 neophytes. Regarding threatened taxa, 34 of 585 taxa recorded (5.8%) are included in the Red list of the flora of the Czech

Tab. 3 – Invasive status of alien taxa in the flora of 131 villages classified according to immigration time, i.e. archaeophytes (plant species introduced to Europe prior to AD 1500), and neophytes (after that date).

	Casual	Naturalized	Invasive	Total
Aliens total	52	125	51	228
Archaeophytes	9	95	16	120 (52.6%)
Neophytes	43	30	35	107 (47.4%)

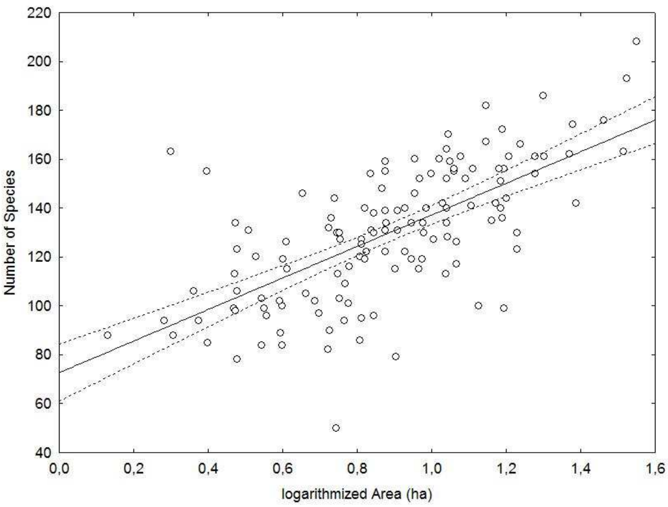

Fig.2 – Relationship between the number of species and the total area of villages. Regression line with 95% confidence intervals is shown.

Republic (Holub & Procházka 2000) and/or Red list of the flora of the southern part of Bohemia (Chán & al. 1999) (e.g., *Agrimonia procera*, *Anthemis cotula*, *Chenopodium vulvaria*, *Epilobium lamyi*, *Malva alcea*, *Melilotus altissimus*, *Ranunculus sardous*, *Verbena officinalis*; see Appendix 3 for the complete list of the threatened taxa). However, most of the threatened taxa found in villages belonged to weeds of nutrient-poor crop fields or meadow species that occasionally migrate into villages from the surrounding landscape.

The number of taxa per village ranged from 50 in little village Záluží u Přídolí to 217 in Brloh (the largest village studied), with average value of 132.8 taxa per village. 107 taxa (18.3%) occurred in only one village, whereas 30 taxa (5.1%) were present in more than 90% of all villages, although no taxon occurred in all 131 villages.

From the studied environmental factors, the total village area was the strongest predictor of the number of taxa in all groups (Fig. 2). The other factors with significant effects on flora diversity were altitude, density, portion of build-up, portion of lawns and portion of abandoned areas within the villages, number of building sites, presence of a main road and presence of poultry (Tab. 4).

Tab. 4 – Variables with significant effect on the number of taxa in studied villages. Percent of variation in the number of taxa explained by the particular variable in RDA for the individual groups of taxa is presented. The significance was tested with Monte-Carlo permutation procedure (999 permutations, Bonferroni correction applied: $\alpha = 0.05 / 18 = 0.0028$). For each variable, marginal and conditional effects in the forward selection procedure are indicated; the values are separated by a slash. n.s. = non signifficant; +/- indicate positive/negative effect of the variables on the number of taxa.

Variable	All taxa	Natives	Aliens	Archaeophytes	Neophytes	Invasive
logArea	+ 73 /+ 73	+ 71 /+ 71	+ 60 /+ 60	+ 64 /+ 64	+ 42 /+ 25	+ 50 /+ 50
logDens	+ 31 /+ 13	+ 18 / n.s.	+ 40 /+ 19	+ 30 /+ 14	+ 47 /+ 47	+ 26 /+ 12
Altitude	- 20 / n.s.	n.s.	- 38 / n.s.	- 37 / n.s.	- 34 / n.s.	n.s. / - 8
Pbuild	+ 33 / n.s.	+ 22 / n.s.	+ 35 / n.s.	+ 43 /+ 5	+ 19 / n.s.	+ 26 / n.s.
Plawns	n.s.	n.s.	- 15 / n.s.	+ 11 / n.s.	- 19 / n.s.	n.s.
Bld_sites	+ 26 / n.s.	+ 18 / n.s.	+ 28 / n.s.	+ 24 / n.s.	+ 27 / n.s.	n.s.
Main_road	n.s.	n.s.	+ 12 / n.s.	+ 12 / n.s.	n.s.	+ 20 / n.s.
Poultry	+ 28 / n.s.	+ 22 / n.s.	+ 26 / n.s.	+ 34 / n.s.	+ 14 / n.s.	+ 26 / n.s.
Paband	n.s.	n.s.	n.s.	n.s.	n.s. / + 14	n.s.

3.2 Species composition

Since semi-quantitative data on species abundances was only available for a part of the dataset (different in the pilot study in 2003), it was desirable to determine potential loss of information when species abundances are omitted and binary (presence/absence) data are used instead. Hence, two analyses with either type of data were conducted and their results compared. The correlation coefficients among ordination scores of individual villages along the main gradient described by the first ordination axis in PCA were $r = 0.772$ for the Basin and $r = 0.759$ for the Foothills. The correlations among the ordination axes and the environmental variables were fairly similar in both analyses.

Similarly, RDA analyses with forward selection of environmental variables resulted in the same sets of significant variables in both cases (data not shown). To summarize, although there is a certain loss of information using only binary data, the use of either type of data leads to discovering of similar structure in species composition data and therefore only binary data were utilized in further analyses.

Principal Component Analysis (PCA) was used to get a general overview of the data structure and similarity of species composition (Fig. 3). The studied villages grouped into two clusters that reflect their actual geographic location: the villages situated in the flat and relatively warm Basin grouped in the lower left corner, whereas villages of hilly and comparably colder mountain foothills grouped in the upper right corner of the diagram. This also corresponds with the phytogeographical division of the Czech Republic (Hejný & Slavík 1988; districts no. 38 and 37, respectively), though small overlap exists due to four villages from the peripheral parts of the Basin that are more similar to the villages of the Foothills. The areas are differentiated especially by the absence of several relatively thermophilous taxa in the Foothills, such as *Amaranthus blitum*, *Amaranthus retroflexus*, *Ballota nigra*, *Lactuca serriola*, *Lamium album*, *Lepidium ruderale*, *Torilis japonica* (Fig. 3).

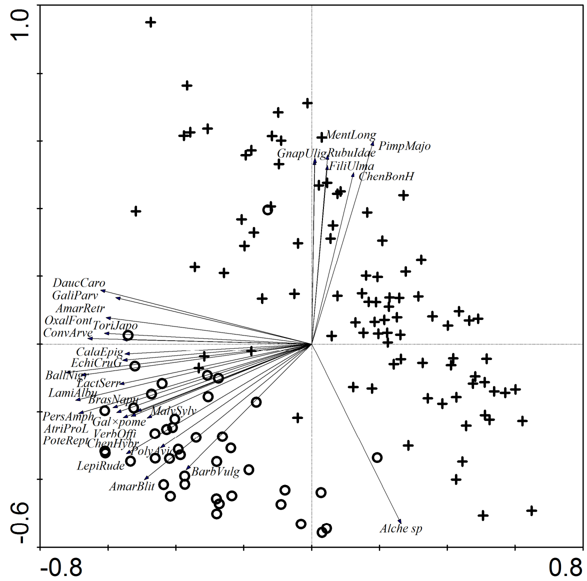

Fig. 3 – Ordination diagram of PCA analysis of 131 villages. Symbols indicate phytogeographical disctricts according to Flora of the Czech Republic (Slavík 1988): cross – Foothills of the Šumava Mts. and the Novohradské hory Mts.; circle – Budějovická pánev Basin. 30 taxa with the highest weight/fit are depicted.

RDA with forward selection of environmental variables identified six factors with significant effect on the species composition in the studied villages. Similarly to the analysis of species diversity, altitude, the total area of villages and density were the strongest predictors of the species composition. The other selected variables were in descending order of significance: portion of build-up area, portion of abandoned areas and portion of cultivated areas within the villages (Fig. 4; Tab. 5).

Tab. 5 – Percent of variation in the species composition explained by selected environmental variables in RDA analysis. Significance was tested with Monte-Carlo permutation procedure (999 permutations, Bonferroni correction was applied. α= 0.05/18 = 0.0028). For each variable, marginal and conditional effects in the forward selection procedure are indicated; the values are separated by a slash. n.s. = non signifficant; +/- indicate positive/negative effect of the variables on the number of taxa.

Altitude	logArea	Pbuild	logDens	Paband	Pwater	Poultry	Pcultiv	AbandHou
+ 26/+ 26	+ 17/+ 13	+ 17/+ 4	+ 13/+ 4	+ 9/+ 9	+ 9/ n.s.	+ 9/ n.s.	+ 4/+ 4	+ 4/ n.s.

4 Discussion

4.1 Diversity of village floras

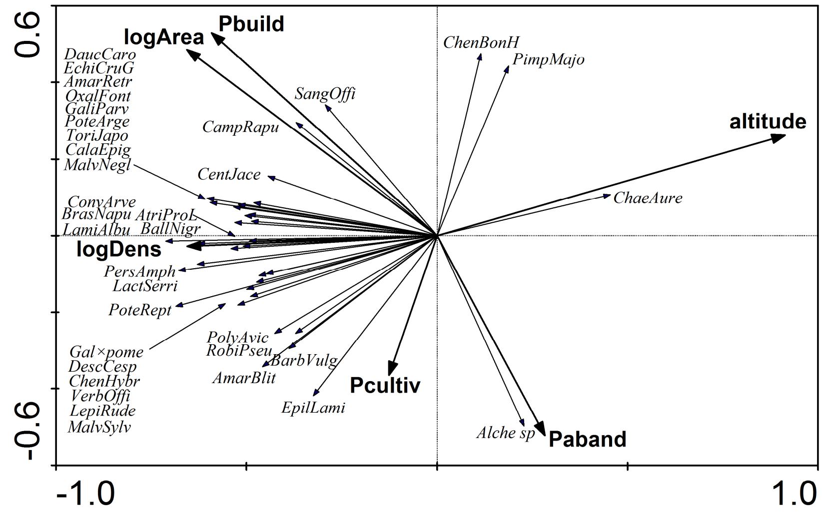

Fig. 4 – RDA of 131 villages. First and second ordination axis are displayed. Environmental variables with significant effect and 35 best fitting species are depicted. The first and the second ordination axis explain 6.8% and 3% of variation of the species data, respectively. All canonical axes together explain 14.3% of variation.

The main factors determining the diversity and composition of village floras on a regional scale are abiotic conditions, especially altitude, and the village size (Ahrns 2009, Pyšek 1993). In our dataset we have found an increase in species numbers with the total area of the villages, a finding similar to the results of previous urban flora studies (e.g. Klotz 1990, Pyšek 1989a, Pyšek 1993), hence it is further concluded that the flora of studied villages follows the same trend that has been reported for floras of cities in general. The increase in species richness reflects a rapid increase of habitat heterogeneity with the settlement size that can then provide more opportunities for species establishment (Pyšek 1993).

The best predictor of both species diversity and composition of the village flora in this study was the altitude. It not only serves as an accurate representation of local climatic conditions such as mean temperature and rainfall intensity but it can also be considered a ‘carrier variable’ that is associated with a number of other factors – for example the amount of available moisture, ground water table, and average slope inclination. These factors were documented to be the most significant predictors of species diversity in a study of 56 villages in Germany and the Czech Republic (Ahrns 2009).

In our study, the role of altitude as the ‘central’ predictor of species diversity was confirmed, as shown in Fig. 4. The effect of altitude is caused mainly by a scarcer occurrence or sheer absence of some relatively thermophilous species in the higher altitudes of the Foothills (e.g. *Ballota nigra*, *Lamium album*, *Lepidium ruderale*, *Polygonum aviculare*). Positive effects of warm climates on representation of alien species in floras have been described repeatedly (e.g. Kowarik 1990, Pyšek 1998b). For instance Mihulka (1998) and Pyšek & al. (2002a) both recorded a decrease in number of aliens with increasing altitude in Central Europe. Therefore a smaller contribution of neophytes in higher altitudes in this study is not unusual and reflects the origin of aliens in warmer areas (Pyšek 1998b). On the other hand there also was a smaller group of indigenous species preferring colder climate, such as *Centaurea pseudophrygia*, *Chaerophyllum aureum*, *Epilobium montanum* and *Primula elatior*. In summary, the effects of altitude and settlement area are consistent with the finding of urban flora studies conducted prior to this date.

However, the main focus of our study was on variables describing the inner structure of villages and human impact for such factors have been only little studied so far. The relationships between the character of villages and their flora are ones of an exceptionally complex character and therefore this topic deserves attention and further study.

As outlined in previous studies of urban floras, the size of human population can serve as a convenient measure of human pressure exerted on vegetation (e.g. Ahrns 2009). In this respect we used density (number of houses per area) and portion of build up area (which besides houses considers also roads and parking places) as factors describing the very structure of a village residential area. For their similar character, these two variables can be considered a simplified proxy of an overall anthropic influence. The number of taxa in all studied groups was positively correlated with these two characteristics. Typically there is substantially more intensive human activity and therefore more disturbances in larger, compactly build-up villages whereas smaller settlements with individual houses scattered alongside a road (i.e. hamlets and recreational houses) provide more space for development of vegetation of semi-natural character. Good examples of such semi-natural habitats are village greens that are often present especially in villages in the South-Bohemian Basin. Such sites provide favourable conditions for meadow species migrating from the surrounding landscape such as *Campanula patula*, *Centaurea jacea*, *Lotus corniculatus*, *Lychnis flos-cuculi*. They also frequently serve as a refuge for many native species that are to be found growing in compact associations there, with only little chance for alien species establishment. The portion of lawns within a village was therefore found to be negatively correlated with the number of neophytes. Village areas of grassland character (village greens, orchards) typically host an established set of native species with the composition close to the landscape surrounding villages where native species are prevailing and only a small number of alien species is established.

From other studied factors, the number of building sites (i.e., houses under construction and reconstructed roads) was documented to lead to an increase in species diversity in all groups (native and alien taxa alike), except for the group of invasive taxa. Building grounds are special sites that are connected with occurrence of early-successional short-lived species of heavily disturbed sites or of weeds typical for nutrient poor crop-fields (e.g. *Amaranthus* spp., *Convolvulus arvensis, Echinochloa crus-galli, Galinsoga parviflora, Lactuca serriola*). Also the potential role of traffic and trading activities as an agent for spread of alien species was confirmed by the significant effect of (the presence of) main road in villages on the number of alien taxa and the number of invasive taxa alike.

Last but not least, a presence of various domestic animals bred in households has been included in this study. Such factors have not been used in similar studies before, and thus no reliable comparison concerning their effects is currently available. In our data, only the presence of poultry had a significant effect on the diversity of flora in studied villages.

Although this result may be caused by the rarity of keeping other animals directly inside the village area. It is likely that the presence of poultry in fact represents a peculiar type of habitat directly influenced by the animals presence. The birds foraging activities result in regular disturbance regime meanwhile the effect of animal droppings contributes to an elevated nutrient content of such sites. *Anthemis cotula*, *Urtica urens* and *Verbena officinalis* are some of the species traditionally recognized in literature to seek habitats influenced by animal presence (e.g., Chán 1999).

Nevetheless a reversed analysis of species and environmental factors revealed *Convolvulus arvensis*, *Galinsoga quadriradiata*, *Matricaria discoidea*, and *Sisymbrium officinale* as the taxa closely related to the presence of poultry in the studied villages. In such analysis, RDA with manual forward selection is employed (with the studied factor used as the dependent variable ('species data') and the presence of individual species as the explanatory variables). For the selected species are rather common and were present in the majority of studied villages, we consider the result of this analysis to be a mere methodological artifact.

4.2 Species composition

Apart from the above mentioned effect of altitude that essentially leads to absence of certain species in higher altitudes, and also the effect of the tottal village area, there are few other factors with significant effect on species composition in studied villages as well. These factors are (in descending order of significance): portion of build-up area, density, portion of abandoned areas and portion of cultivated grounds within villages.

In all analyses working with a greater number of explanatory factors, certain extend of correlation among explanatory variables can be expected. It is for instance the case of the portion of build-up area and the total village area in this study. As shown in the ordination diagram (Fig. 4), these factors are highly correlated. Thus it can be concluded that using any other variable but village area in this case does not add any further ecological information on species composition. Furthermore the effect of the number of houses per village area, as it has already been discussed in the paragraph on species diversity, has proven to be significant also in the analysis of species composition. Some species indicated by a reversed analysis where density was used as dependent variable, were e.g. *Ballota nigra*, *Lactuca serriola*, *Potentilla reptans*, *Ranunculus acris*. It is possible that for larger villages with higher density of build-up area, there is a group of species favouring such village structure and therefore connected to this factor. Although it remains to be confirmed, since there is no definite answer to this question and further study of this problem is desirable.

Last but not least, the RDA with forward selection also selected portion of abandoned areas and portion of cultivated ground within a village as factors with significant effect on species composition in the studied villages. The former character represents presence of sites left to spontaneous processes such as compost heaps and un-mowed village greens that commonly host ruderal flora and vegetation (e.g. *Alchemilla* sp., *Artemisia vulgaris*, *Pimpinela saxifraga*). It also includes ruins of old houses and abandoned gardens at least partly covered by shrubs and often presenting some scree (ruins of old houses or garden fences). Species specifically confined to such sites were for example *Geranium robertianum* and *Sambucus nigra*. Portion of cultivated ground on the other hand, represents flower and vegetable beds and orchards within the village grounds. Such sites are associated with garden weeds and unexpectedly also some meadow species, which often find their way into the villages from the surrounding landscape (*Alchemilla* spp., *Glechoma hederacea*, *Helianthemum obscurum*, *Senecio vulgaris* and *Taraxacum* sect. *Ruderalia*).

4.3 Alien species in village flora

Whereas the number of alien species serves as a direct measure of an extent of the invasion process into certain geographic area, the percentage of alien species can be related to the potential impact on the ecosystems of receiving areas (Pino & al. 2005). The overall percentage of alien species found in the studied villages was rather high at 41.6%. However, a comparison of the acquired percentage of neophytes in our data revealed that our result (around 19.7%) was clearly at a lower end of studies of other areas in (Central) Europe, such as 17.3% in eastern Germany (Deutschewitz & al. 2003), 26.5% in central Germany (Wania & al. 2006), 25.2% in the Czech Republic (Pyšek & al. 1998b).

Likely reason for smaller contribution of neophytes recorded in our study is that we only focused on flora of villages whereas most of the abovementioned studies also included towns and larger cities. Within traditional villages there are more semi-natural sites dominated by communities of native taxa. Moreover the traffic and trading activities that signifficantly promote chances of alien species migrating into settlements are of a much greater extend in cities and towns rather than in villages. Furthermore, as discussed in Pyšek (1989b), portion of neophytes would be substantially higher if the area in question was studied repeatedly over longer period of time due to essential share of ephemerophytes on alien flora that occur randomly and unpredictably depending on a season of a year.

Even though being substantially lower than in studies of flora of towns and cities, the number of neophytes found in the studied villages was artificially elevated by number of species that are native for the Czech Republic but were considered not native in the studied area (Hejný & Slavík 1988, 1990, 1992, Slavík 1995, 1997, 2000, Slavík & Štěpánková 2004, Štěpánková 2010), such as e.g. *Aquilegia vulgaris*, *Aurinia saxatilis*, *Geranium pratense*, *Hieracium aurantiacum*, *Melilotus altissimus* and *Puccinellia distans*.

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6 Appendices

Appendix 1
List of the studied villages. For each village the average altitude is shown.

Budějovická pánev Basin	Altitude (m a.s.l.)
Babice	447
Branišov	408
Břehov	403
Čakov	450
Čejkovice	389
Česká Lhota	396
Češnovice	388
Dehtáře	400
Dolní Chrášťany	475
Dubenec	389
Dubné	410
Haklovy Dvory	380
Hláska	440
Hlavatce	403
Holuboská Bašta	410
Chvalovice	461
Jaronice	398
Kaliště u Lipí	441
Křenovice	411
Lékařova Lhota	400
Lipí	440
Lužice	460
Mahouš	425
Malé Chrášťany	412
Malovice	411
Malovičky	411
Němčice	431
Novosedly u ČB	395
Olšovice	438
Pašice	391
Pištín	398
Plástovice	398
Podeřiště	421
Radošovice	433
Sedlec	397
Sedlovice	442
Strýčice	423
Třebín	417
Tupesy	414
Vlhlavy	405
Záboří	430
Zálužice	393
Zbudov	387
Zvěřetice	447
Žabovřesky	394

The Šumava Mts. Foothills	Altitude (m a.s.l.)
Blatná	771
Blažkov	633
Bohdalovice	627
Bujanov	672
Dolní Pláně	647
Hašlovice	601
Hněvanov	669
Horní Jílovice	717
Chabičovice	567
Malčice	584
Malšín	804
Mezipotočí	615
Michnice	732
Mirkovice	540
Močerady	702
Mokrá	800
Muckov	786
Mýto	715
Novosedly u ČK	576
Omlenice	665
Omlenička	671
Ostrov	769
Práčov	643
Přídolí	672
Přízeř	642
Rožmitál na Šumavě	631
Sedlice	655
Skláře	675
Slavkov	772
Slubice	578
Spolí	641
Stradov	583
Střítež	676
Suš	623
Svachova Lhotka	510
Svéráz	641
Světlík	784
Šebanov	635
Větrná	699
Věžovatá Pláně	697
Výnězda	734
Zahořánky	820
Zahrádka	583
Záluží u Přídolí	696
Zubčice	632
Žalčice	548

The Blanský les Mts.	Altitude (m a.s.l.)
Bohouškovice	575
Borová	625
Brloh	570
Čakovec	440
České Chalupy	590
Dobčice	500
Habří	450
Holašovice	505
Holubov	510
Horní Chrášťany	525
Chlum	510
Chlumeček	530
Chmelná	545
Jankov	485
Jánské Údolí	620
Jaronín	640
Krásetín	560
Křenov	555
Kvítkovice	450
Lazec	595
Lhotka	545
Lipanovice	505
Loučej	585
Mříč	530
Nová Ves	560
Plešovice	515
Přísečná	535
Rojšín	550
Sedm Chalup	585
Slavče	520
Smědeč	595
Smědeček	640
Srnín	545
Staré Dobrkovice	510
Stupná	525
Třešňový Újezdec	555
Třísov	540
Vodice	560
Vyšný	580
Zlatá Koruna	500

Appendix 2
List of 366 taxa used in statistical analyses, with abbreviations used in ordination diagrams.

Abbreviation	Taxon
AegoPoda	*Aegopodium podagraria*
AethCyna	*Aethusa cynapium*
AgriEupa	*Agrimonia eupatoria*
AgriProc	*Agrimonia procera*
AgroCapi	*Agrostis capillaris*
AgroGiga	*Agrostis gigantea*
AgroStol	*Agrostis stolonifera*
AchiMill	*Achillea millefolium* agg.
AjugRept	*Ajuga reptans*
Alche sp	*Alchemilla* species
AmarBlit	*Amaranthus blithoides*
AlliPeti	*Alliaria petiolata*
AmarCaud	*Amaranthus caudatus*
AmarPowe	*Amaranthus powellii*
AmarRetr	*Amaranthus retroflexus*
AnagArve	*Anagallis arvensis*
AnetGrav	*Anethum graveolens*
AngeSylv	*Angelica sylvestris*
AnthArve	*Anthemis arvensis*
AnthSylv	*Anthriscus sylvestris*
AntiMaju	*Antirrhinum majus*
AperSpiv	*Apera spica-venti*
AquiVulg	*Aquilegia vulgaris*
ArabThal	*Arabidopsis thaliana*
ArctLapp	*Arctium lappa*
ArctMinu	*Arctium minus*
Arct sp	*Arctium* species
ArctTome	*Arctium tomentosum*
Arct×	*Arctium lappa × tomentosum*
ArenSerp	*Arenaria serpyllifolia*
ArmoRust	*Armoracia rusticana*
ArrhElat	*Arrhenatherum elatius*
ArteVulg	*Artemisia vulgaris*
AspaOffi	*Asparagus officinalis*
AsplRutM	*Asplenium ruta-muraria*
AsplTric	*Asplenium trichomanes*
AsteLanc	*Aster lanceolata*
AstrGlyc	*Astragalus glycyphyllos*
AthyFilF	*Athyrium filix-femina*
AtriHort	*Atriplex hortensis*
AtriPatu	*Atriplex patula*
AtriProL	*Atriplex prostrata* subsp. *latifolia*
AtriSagi	*Atriplex sagittata*
AvenSati	*Avena sativa*
BalloNigr	*Ballota nigra*
BarbVulg	*Barbarea vulgaris*
BellPere	*Bellis perennis*
BetoOffi	*Betonica officinalis*
BistMajo	*Bistorta major*
BracPinn	*Brachypodium pinnatum*
BrasNapu	*Brassica napus*
BromCari	*Bromus carinatus*
BromHord	*Bromus hordeaceus*
CalaEpig	*Calamagrostis epigejos*
CaleOffi	*Calendula officinalis*
CalySepi	*Calystegia sepium*
CampPatu	*Campanula patula*
CampPers	*Campanula persicifolia*
CampRapu	*Campanula rapunculoides*
CampRotu	*Campanula rotundifolia*
CampTrac	*Campanula trachelium*
CapsBuPa	*Capsella bursa-pastoris*
CareBriz	*Carex brizoides*
CareHirt	*Carex hirta*
CareMuri	*Carex muricata* s. str.
CaruCarv	*Carum carvi*
CentCyan	*Centaurea cyanus*
CentJace	*Centaurea jacea*
CentScab	*Centaurea scabidosa*
CeraArve	*Cerastium arvense*
CeraBieb	*Cerastium biebersteinii*
CeraGlut	*Cerastium glutinosum*
CeraHolo	*Cerastium holosteoides*
ChaeArom	*Chaerophyllum aromaticum*
ChaeAure	*Chaerophyllum aureum*
ChaeHirs	*Chaerophyllum hirsutum*
CheaTemu	*Chaerophyllum temulum*
CheliMaju	*Chelidonium majus*

ChenAlbu	*Chenopodium album* agg.
ChenPedu	*Chenopodium album* subsp. *pedunculare*
ChenBonH	*Chenopodium bonus-henricus*
ChenFici	*Chenopodium ficifolium*
ChenGlau	*Chenopodium glaucum*
ChenHybr	*Chenopodium hybridum*
ChenPoly	*Chenopodium polyspermum*
ChenRubr	*Chenopodium rubrum*
ChenStrf	*Chenopodium striatiforme*
ChenStrm	*Chenopodium strictum*
ChenSuec	*Chenopodium suecicum*
CichInty	*Cichorium intybus*
CirsArve	*Cirsium arvense*
CirsOler	*Cirsium oleraceum*
CirsPalu	*Cirsium palustre*
CirsVulg	*Cirsium vulgare*
ClinVulg	*Clinopodium vulgare*
ConvArve	*Convolvulus arvensis*
ConyCana	*Conyza canadensis*
CrepBien	*Crepis biennis*
CrepCapi	*Crepis capillaris*
CuscEuro	*Cuscuta europaea*
CystFrag	*Cystopteris fragilis*
DactGlom	*Dactylis glomerata*
DatuStra	*Datura stramonium*
DaucCaro	*Daucus carota*
DescSoph	*Descurainia sophia*
DescCesp	*Deschampsia caespitosa*
DianDelt	*Dianthus deltoides*
DigiIsch	*Digitaria ischaemum*
DigiSang	*Digitaria sanguinalis*
DipsFull	*Dipsacus fullonum*
DryoFilM	*Dryopteris filix-mas*
EchiCruG	*Echinochloa crus-galli*
EchiSphe	*Echinops sphaerocephalus*
EchiVulg	*Echium vulgare*
ElymCani	*Elymus caninus*
ElytRepe	*Elytrigia repens*
EpilAngu	*Epilobium angustifolium*
EpilCili	*Epilobium ciliatum*
EpilHirs	*Epilobium hirsutum*
EpilMont	*Epilobium montanum*

EpilRose	*Epilobium roseum*
EpilLamy	*Epilobium lamyi*
EragMino	*Eragrostis minor*
ErigAnnu	*Erigeron annuus*
ErodCicu	*Erodium cicutarium*
ErysDuru	*Erysimum durum*
ErysChei	*Erysimum cheiranthoides*
EuphCypa	*Euphorbia cyparissias*
EuphEsul	*Euphorbia esula*
EuphHeli	*Euphorbia helioscopia*
EuphLath	*Euphorbia lathyris*
EuphPepl	*Euphorbia peplus*
FallConv	*Fallopia convolvulus*
FallDume	*Fallopia dumetorum*
FestArun	*Festuca arundinacea*
FestBrev	*Festuca brevipila*
FestGiga	*Festuca gigantea*
FestPrat	*Festuca pratensis* agg.
FestRubr	*Festuca rubra* agg.
FiliUlma	*Filipendula ulmaria*
FragMosc	*Fragaria moschata*
FragVesc	*Fragaria vesca*
FragViri	*Fragaria viridis*
FumaOffi	*Fumaria officinalis*
GalbArge	*Galeobdolon argentatum*
GaleBifi	*Galeopsis bifida*
GalePube	*Galeopsis pubescens*
GaleSpec	*Galeopsis speciosa*
GaleTetr	*Galeopsis tetrahit*
GaliParv	*Galinsoga parviflora*
GaliQaud	*Galinsoga quadriradiata*
GaliApar	*Galium aparine*
GaliBore	*Galium boreale*
GaliPalu	*Galium palustre*
GaliPumi	*Galium pumilum*
Gal×pome	*Galium × pomeranicum*
GeraDiss	*Geranium dissectum*
GeraPalu	*Geranium palustre*
GeraPrat	*Geranium pratense*
GeraPusi	*Geranium pusillum*
GeraPyre	*Geranium pyrenaicum*
GeraRobe	*Geranium robertianum*
GeumUrba	*Geum urbanum*

GlecHede	*Glechoma hederacea*
GnapSylv	*Gnaphalium sylvaticum*
GnapUlig	*Gnaphalium uliginosum*
HeliObsc	*Helianthemum grandiflorum* subsp. *obscurum*
HeliTube	*Helianthus tuberosus*
HeraSpho	*Heracleum sphondylium*
HierAura	*Hieracium aurantiacum*
HierPilo	*Hieracium pilosella*
HierSaba	*Hieracium sabaudum*
HolcLana	*Holcus lanatus*
HolcMoli	*Holcus mollis*
HordVulg	*Hordeum vulgare*
HumuLupu	*Humulus lupulus*
HyloJuli	*Hylotelephium jullianum*
HypeMacu	*Hypericum maculatum*
HypePerf	*Hypericum perforatum*
HypeTetr	*Hypericum tetrapterum*
HypoRadi	*Hypochaeris radicata*
ImpaGlan	*Impatiens glandulifera*
ImpaNoliT	*Impatiens noli-tangere*
ImpaParv	*Impatiens parviflora*
JoviGlob	*Jovibarba globifera*
JuncArti	*Juncus articulatus*
JuncBufo	*Juncus bufonius*
JuncComp	*Juncus compressus*
JuncEffu	*Juncus effusus*
JuncTenu	*Juncus tenuis*
KnauArve	*Knautia arvensis*
KochScop	*Kochia scoparia*
LactSerr	*Lactuca serriola*
LamiAlbu	*Lamium album*
LamiMacu	*Lamium maculatum*
LamiPurp	*Lamium purpureum*
LapsComm	*Lapsana communis*
LathPrat	*Lathyrus pratensis*
LeonAutu	*Leontodon autumnalis*
LeonHisp	*Leontodon hispidus*
LeonCard	*Leonurus cardiaca*
LepiRude	*Lepidium ruderale*
LeucVulg	*Leucanthemum vulgare* agg.
LinaVulg	*Linaria vulgaris*
LoliMult	*Lolium multiflorum*

LoliPere	*Lolium perenne*
LotuCorn	*Lotus corniculatus*
LunaAnnu	*Lunaria annua*
LupiPoly	*Lupinus polyphyllus*
LychCoro	*Lychnis coronaria*
LychFloC	*Lychnis flos-cuculi*
LysiNumm	*Lysimachia nummularia*
LysiPunc	*Lysimachia punctata*
LysiVulg	*Lysimachia vulgaris*
MalvAlce	*Malva alcea*
MalvMosc	*Malva moschata*
MalvNegl	*Malva neglecta*
MalvSylv	*Malva sylvestris*
MatrDisc	*Matricaria discoidea*
MatrRecu	*Matricaria recutita*
MediLupu	*Medicago lupulina*
MediSati	*Medicago sativa*
MeliAlbu	*Melilotus albus*
MeliAlti	*Melilotus altissimus*
MeliOffi	*Melilotus officinalis*
MelisOff	*Melissa officinalis*
MentArve	*Mentha arvensis*
MentLong	*Mentha longifolia*
Ment sp	*Mentha* species
MyosArve	*Myosotis arvensis*
MyosPalA	*Myosotis palustris* agg.
MyonAqua	*Myosoton aquaticum*
OdonVern	*Odontites vernus*
OenoBien	*Oenothera biennis*
Oeno sp	*Oenothera* species
OnopAcan	*Onopordum acanthium*
OrigVulg	*Origanum vulgare*
OxalCorn	*Oxalis corniculata*
OxalFont	*Oxalis fontana*
OxalStri	*Oxalis stricta*
PaniMili	*Panicum miliaceum*
PapaRhoe	*Papaver rhoeas*
PastSati	*Pastinaca sativa*
PersAmph	*Persicaria amphibia*
PersHydr	*Persicaria hydropiper*
PersLapa	*Persicaria lapathifolia*
PersMacu	*Persicaria maculosa*
PhalArun	*Phalaris arundinacea*

PhalPict	*Phalaris arundinacea var. picta*
PhlePrat	*Phleum pratense*
PhysAlke	*Physalis alkekengi*
PimpMajo	*Pimpinella major*
PimpSaxi	*Pimpinella saxifraga*
PlanLanc	*Plantago lanceolata*
PlanMajo	*Plantago major*
PlanMedi	*Plantago media*
PoaAnnu	*Poa annua*
PoaComp	*Poa compressa*
PoaNemo	*Poa nemoralis*
PoaPalu	*Poa palustris*
PoaPrat	*Poa pratensis*
PolyAvic	*Polygonum aviculare*
PortOler	*Portulaca oleracea*
PoteAnse	*Potentilla anserina*
PoteArge	*Potentilla argentea*
PoteRept	*Potentilla reptans*
PoteSupi	*Potentilla supina*
PoteTabe	*Potentilla tabernaemontani*
PrunVulg	*Prunella vulgaris*
PrunSpin	*Prunus spinosa*
PuccDist	*Puccinellia distans*
PulmOffi	*Pulmonaria officinalis*
PyrePart	*Pyrethrum parthenium*
RanuAcri	*Ranunculus acris*
RanuRepe	*Ranunculus repens*
RaphRaph	*Raphanus raphanistrum*
ReynJapo	*Reynoutria japonica*
RhusHirt	*Rhus hirta*
RobiPseu	*Robinia pseudacacia*
RoriPalu	*Rorippa palustris*
RoriSylv	*Rorippa sylvestris*
RosCanAg	*Rosa canina* agg.
RubuCaes	*Rubus caesius*
RubuFrut	*Rubus fruticosus* agg.
RubuIdae	*Rubus idaeus*
RumeAcet	*Rumex acetosa*
RumeAcel	*Rumex acetosella*
RumeCris	*Rumex crispus*
RumeObtu	*Rumex obtusifolius*
SagiProc	*Sagina procumbens*

SambNigr	*Sambucus nigra*
SangOffi	*Sanguisorba officinalis*
SapoOffi	*Saponaria officinalis*
ScirSylv	*Scirpus sylvaticus*
ScroNodo	*Scrophularia nodosa*
ScutGale	*Scutellaria galericulata*
SeduAcre	*Sedum acre*
SeduAlbu	*Sedum album*
SeduHisp	*Sedum hispanicum*
SeduRupe	*Sedum rupestre*
SeduSexa	*Sedum sexangulare*
SeliCarv	*Selinum carvifolia*
SeneJaco	*Senecio jacobaea*
SeneVisc	*Senecio viscosus*
SeneVulg	*Senecio vulgaris*
SetaPumi	*Setaria pumila*
SetaViri	*Setaria viridis*
SileLatA	*Silene latifolia* subsp. *alba*
SileVulg	*Silene vulgaris*
SinaArve	*Sinapis arvensis*
SisyOffi	*Sisymbrium officinale*
SolaDulc	*Solanum dulcamara*
SolaLyco	*Solanum lycopersicum*
SolaNigr	*Solanum nigrum*
SoliCana	*Solidago canadensis*
SoliGiga	*Solidago gigantea*
SoncArve	*Sonchus arvensis*
SoncAspe	*Sonchus asper*
SoncOler	*Sonchus oleraceus*
SperArve	*Spergula arvensis*
SperRubr	*Spergularia rubra*
StacPalu	*Stachys palustris*
StacSylv	*Stachys sylvatica*
StelGram	*Stellaria graminea*
StelHolo	*Stellaria holostea*
SympOffi	*Symphytum officinale*
TageErec	*Tagetes erecta*
TanaPart	*Tanacetum parthenium*
TanaVulg	*Tanacetum vulgare*
TaraRude	*Taraxacum* sect. *Ruderalia*
TeleSpec	*Telekia speciosa*
ThlaArve	*Thlaspi arvense*
ThymPule	*Thymus pulegioides*

ToriJapo	*Torilis japonica*
TragPrat	*Tragopogon pratensis*
TrifArve	*Trifolium arvense*
TrifHybr	*Trifolium hybridum*
TrifMedi	*Trifolium medium*
TrifPrat	*Trifolium pratense*
TrifRepe	*Trifolium repens*
TripInod	*Tripleurospermum inodorum*
TrisFlav	*Trisetum flavescens*
TritAest	*Triticum aestivum*
TusiFarf	*Tussilago farfara*
UrtiDioi	*Urtica dioica*
UrtiUren	*Urtica urens*
VerbAust	*Verbascum chaixii* subsp. *austriacum*
VerbNigr	*Verbascum nigrum*
VerbPhlo	*Verbascum phlomoides*
Verb sp	*Verbascum* species
VerbThap	*Verbascum thapsus*
VerbOffi	*Verbena officinalis*
VeroArve	*Veronica arvensis*
VeroCham	*Veronica chamaedrys*
VeroOffi	*Veronica officinalis*
VeroPers	*Veronica persica*
VeroSerp	*Veronica serpyllifolia*
ViciCrac	*Vicia cracca*
ViciHirs	*Vicia hirsuta*
ViciSepi	*Vicia sepium*
ViciTetr	*Vicia tetrasperma*
VincMino	*Vinca minor*
ViolArve	*Viola arvensis*
ViolOdor	*Viola odorata*
ViolTric	*Viola tricolor*
Viol×W	*Viola × wittrockiana*

Appendix 3

List of threatened taxa found in the studied villages, based on the Red list of the flora of the Czech republic (CZ; Holub & Procházka 2000) and of South Bohemia (SB; Chán 1999). The levels of threat are: C1 – critically threatened taxa (roughly corresponding to IUCN category CR), C2 – strongly threatened taxa (~ IUCN: EN), C3 – threatened taxa (~ IUCN: VU), C4 – rare or scattered taxa, requiring further study and monitoring (~ IUCN: LC).

Species	**CZ**	**SB**
Agrimonia procera	C3	
Anchusa officinalis		C4
Anthemis cotula	C3	C2
Aphanes arvensis	C3	C3
Aquilegia vulgaris	C3	C3
Aurinia saxatilis	C4	C4
Carduus nutans	C4	
Carex bohemica	C4	C3
Carex buekii	C4	
Carex elata	C3	C3
Carex riparia	C4	
Centaurea pseudophrygia		C4
Dianthus armeria		C2
Dianthus carthusianorum		C4
Epilobium lamyi		C4
Epilobium obscurum	C3	C2
Epipactis helleborine	C4	
Festuca brevipila		C4
Galium boreale	C4	C4
Geranium dissectum		C4
Hieracium aurantiacum	C3	C4
Chenopodium vulvaria	C2	C1
Isolepis setacea	C3	C2
Lycopsis arvensis		C4
Malva alcea	C4	C4
Melilotus altissimus	C3	
Nymphoides peltata	C1	C1
Picris hieracioides		C4
Polystichum aculeatum	C4	C2
Primula elatior		C4
Ranunculus sardous	C1	C2
Salvia glutinosa		C4
Serratula tinctoria	C4	C4
Verbena officinalis	C3	C2