TITLE of AGREEMENT	CWR in EURISCO
AGREEMENT NUMBER	L22ROM103
IMPLEMENTING PARTNER	Gene Bank, Crop Research Institute, Prague (CRI)
AUTHOR OF THE REPORT	Vojtěch Holubec
DATE SUBMITTED	23 November 2023
TYPE OF REPORT	Extension of EURISCO for Crop Wild Relatives (CWR) in situ data and preparation. 4th report
ABSTRACT (Maximum 200 words)	Within the Czech Republic a strategy for conservation of CWR was compiled and published (Taylor et al. 2017). This Strategy is used for further planning of in situ and on farm conservation of PGR. Selection of CWR species and populations preferably in the category of endangered species for in situ conservation was done. Botanical monitoring of selected populations was undertaken. The system GRIN Czech was revised for minimum descriptors required to upload in situ data to EURISCO. Currently the system is able to accommodate *in situ* data. Two sites were uploaded as testing. Collaboration with ENVI sector was started on joining effords on "donor plots" for seed collecting within protected areas that can be used as *in situ* plots. Here the material is protected and could be also available. The original collected seeds can be deposited in the Gene bank as a liason institution. The AGRI partner, the GB will select target populations of CWR of interest.
KEYWORDS	Country/Region: CZE Crop(s): CWR Subject: selection of species, monitoring, documentation

Final Report

Introduction

Populations of crop wild relatives (CWR) occurring *in situ* are potentially valuable resources for crop science and plant breeding. Therefore, they need to be conserved and made available to users. However, the current conservation of, and access to these CWR populations varies strongly. *In situ* conservation of CWR is often in the hands of nature conservation organizations, who are sometimes not even aware that they are managing these resources. Other CWR populations occur in farmers' fields, roadsides, and other locations, where they are not managed at all. Furthermore, information about the CWR populations, their occurrence and availability, is hardly available.

The ECPGR Concept for *in situ* conservation of crop wild relatives in Europe (Maxted *et al.* 2015) stressed the importance of identifying the important CWR diversity both at the national and regional level. In this context, Weise et al. (2020) explored the possible extension of EURISCO for *in situ* crop wild relatives and on-farm landrace data and proposed a set of descriptors that could be used for this purpose. The Secretariat of the ITPGRFA published an international standard of descriptors for CWR conserved *in situ* in an attempt to promote the documentation of these genetic resources and enable countries to compile and exchange data held by different national and international organizations (Alercia et al., 2021).

CWR in *ex situ* genebank collections are included in the Czech documentation system GRIN Czech and thus annually uploaded to EURISCO. And although it is in principle possible to include *in situ* populations in EURISCO, provided that they are managed at the standard of *ex situ* collections, i.e., with a 'holding institute' that can also be approached for access.

Strategy for conservation of CWR

The Flora of Czech Republic counts 3713 species and subspecies belonging to 965 genera. The documentation system GRIN Czech under the National programme for conservation a use of plant genetic resources and agrobiodiversity includes 1392 species belonging to 463 genera. The system also includes 137 spp. of rare, protected and threaten species, that are not available within GRIN Czech on-line application.

Within the Czech Republic we proposed a strategy for conservation of CWR and published (Taylor et al. 2017). We collated data from the species occurrence database of the Nature Conservation Agency of the Czech Republic (AOPK CR, 2012). Another important source of data were collecting databases at the Genebank, Crop Research Institute, Prague (Holubec et al., 2014). The coverage of collecting activities is good for mountainous areas (Fig. 1). However we found collecting gaps in central and southern part of the country (Fig. 2). The brown marked spots show still rich regions in CWR, however not covered by collecting missions.

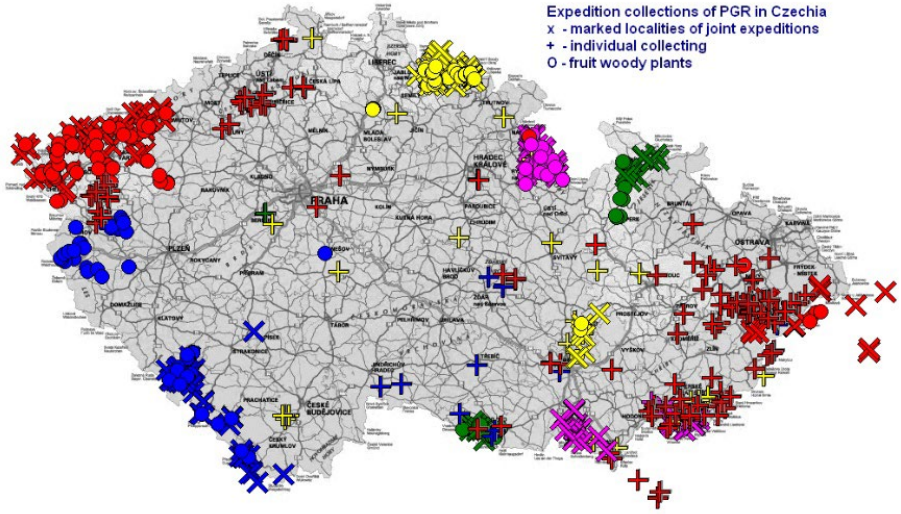


Fig. 1 Collecting and monitoring missions in the Czech Republic

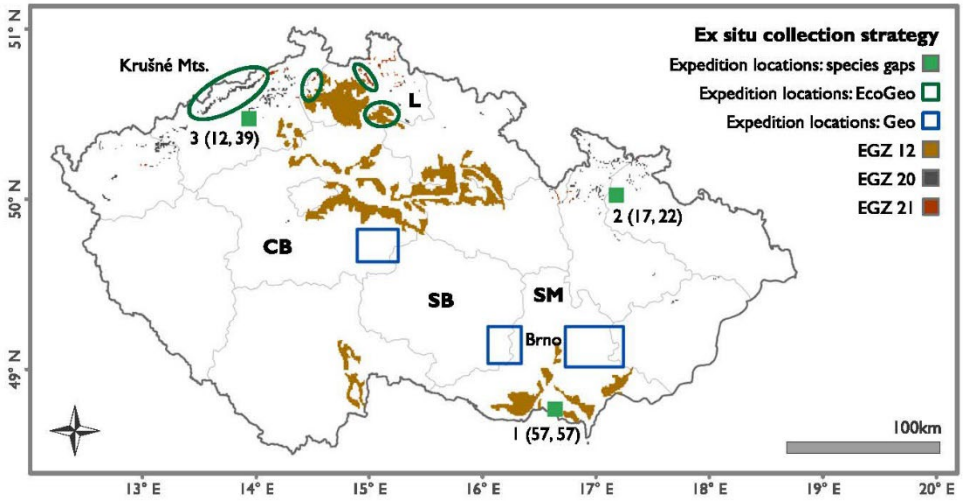


Fig. 2. Gaps in collecting activities of CWR in the Czech Republic.

We generated a CWR checklist (national Inventory) of food and feed species for the Czech Republic (Appendix 1, sheet 1) and generated a map of observed priority richness in the Czech Republic (Fig. 3). The richest grid cells with over 80 precent CWR were found in Southern Moravia and Czech Karst, in the area SW of Prague.

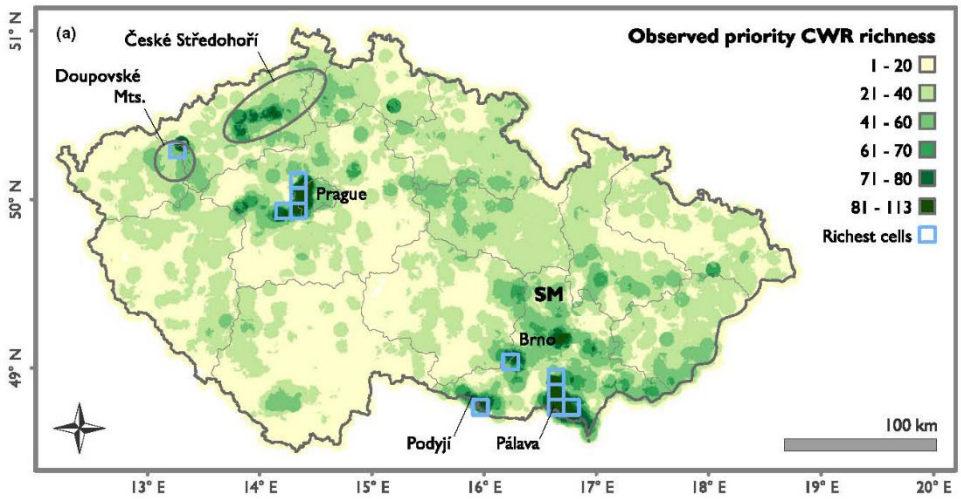


Fig. 3. Observed priority richness in the Czech Republic.

We prioritized taxa for food crops (203 spp., Appendix1 sheet 2) and taxa for fodder crops (297 spp., Appendix 1 sheet 3). To the food and fodder database (Appendix1 sheet 4) we added several important other/industrial crops, like hop and flax and finally selected 204 taxa with the highest priority (Appendix1 sheet 5). For those 204 priority CWR species, we collated 206,760 presence records. We carried out spatial analyses to identify patterns in species richness, gaps in existing conservation actions, complementary conservation networks and collecting strategies to increase representativeness of gene bank accessions. 160 species (78.4% of the inventory) occur in five or more spatially distinct protected areas, providing some insurance against stochastic or anthropic extinction. However, 16 priority CWR have been recorded in only one protected area. Active *in situ* conservation of priority CWR should be instigated within 14 overlapping protected areas. On the base of complementarity analysis the main priority areas as the top 11 cells from (large green squares) were identified. The richest areas of omitted ecogeographic zones (small blue areas) and an additional species-rich area fill a conspicuous geographic gap (Fig. 4).

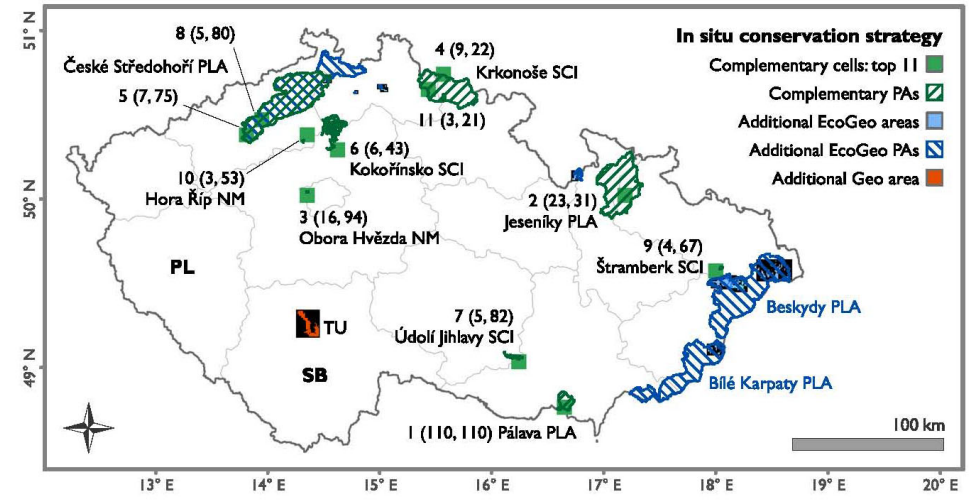


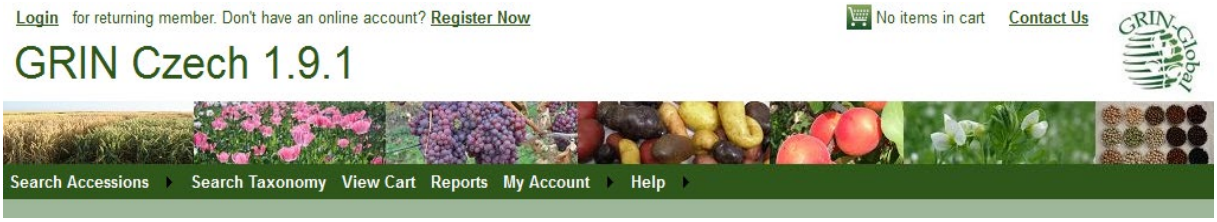
Fig. 4. In situ conservation strategy Priority areas are the top 11 cells from complementarity analysis (large green squares), the richest areas of omitted ecogeographic zones (small blue areas) and an additional species-rich area to fill a conspicuous geographic gap.

Documentation of *in situ* conservation

Czech Gene Bank runs the National PGR documentation system GRIN Czech since 2015 after replacing of an old system EVIGEZ (running since 1984). The GRIN Czech documentation system enables a wide extension of descriptors and increasing diversity of data. The system was revised for presence of minimum descriptors required to upload *in situ* data to EURISCO. Currently the system is able to accommodate necessary *in situ* data.

Descriptors for *in situ* conservation recommended by van Hintum (2022) were activated in the documentation system GRIN Czech. The data for population of *Allium schoenoprasum* monitored in the locality Děčín was taken as the second case study and all available site info were uploaded in the documentation system. Descriptors activated are shown in the table 1.

Table 1. Documentation GRIN Czech adjusted to in situ conservation. Case sample: *Allium schoenoprasum* population



Accession ID	09H04
DOI	N
Taxon	Allium schoenoprassum ssp. schoenoprasum
Name	
Origin	Czech Republic
Maintenance Site	Decin
Is Backed Up?	Y
Backup Location	CZE122 (CRI Gene Bank)
Status	Not active
Life Form	Perennial
Level Of Improvement	Wild
sampstat	100
Reproductive Uniformity	Population
Received As	Seed collection
Received Date	2023
Is Web Visible?	N
Note	Curator: Vojtěch Holubec
ploidy	2

Accession Source ID	1028907
Source Type	Collection source event
Source Date	2023
Geography	Czech Republic
Is Origin?	N
Collecting or Acquisition Source	Weedy, disturbed, or ruderal habitat
Quantity Collected	30
Unit Quantity Collected	gram

Collected Form	Seed collection
Number Plants Sampled	20
Environment Description	Bank of Elbe River
Collector Verbatim Locality	Děčín, 50 m N of railway bridge
Elevation (meters)	125
Latitude	50.7768808N
lat_str	50°46'36.771"N
Longitude	14.2046225E
long_str	14°12'16.641"E
Georeference Protocol	Lat/lon determined by GPS
Associated Species	*Lolium perenne*, *Phalaris arundinacea*, *Poa pratensis*, *Plantago lanceolata*
Is Web Visible?	N

Research and monitoring of *in situ* candidate populations

The research of CWR populations was preferably devoted to endangered species marked by red list categories C1, C2, C3 and C4 (Procházka, 2001, PLADIAS, 2022, Botany.cz, 2023). Czech Republic is rich in many minor crops like grasses, fodder crops, fruits, vegetables, condiments etc. The main Czech herbaria (PR, PRC, BRNU) were visited and plant databases were checked. Selected endangered species were considered for *in situ* conservation within CWR category and confirm the choice from prioritization shown in Appendix 1 sheet 4.

A long-term monitoring programme is applied to two populations of *Allium schoenoprasum* in Vltava and Elbe River Basin (Zbraslav, Jarov, Děčín), two populations of *Hierochloe odorata* in Elbe River basin (Grado, Václavka) and *Astragalus excapus* in Czech Middle Mts. (Radobýl). Long, but not continuous monitoring of populations of endangered grasses and legumes was conducted in S Moravia. Recent monitoring of *Triticeae* grasses (*Agropyron pectinatum* and *Aegilops cylindrica*) was undertaken during the past two years.

The monitoring has taken place during the period of full vegetation in May to June. All types of vascular plants were recorded at the locations (nomenclature was unified according to Kaplan et al. (2021). Permanent plots of 3 x 3 m size were marked on each locality, where phytosociological relevés were recorded using the Braun-Blanquet combined scale of abundance and dominance (Hédl 2005). Relevé comparison was used to monitor floristic development over time. Botanical diversity was assessed based on the calculation of the Shannon (H) and Simpson index (D) and their standardized version of Evenness (Eh and Ed). Development of the number of species on the area and the value of the Shannon index was evaluated graphically in terms of the trends of individual indicators in connection with previous years.

Coordination of activities between agricultural and environmental sectors

In situ conservation of CWR should be harmonized with environmental sector – Ministry of Environment and its acting bodies: National Parks and Agency for Conservation of Nature and Landscape (AOPK). CWR are materials of interest only for agriculture, but their conservation in the wild nature is a subject for both parties. Two coordination meetings with Department of species protection of AOPK were organized during 2023. Side by side the problem of in situ conservation is being solved in the manuscript: Guidelines for *in situ* conservation (Holubec et al, 2023 in prep.) which was sent for reviewing to AOPK. The problem are protected plants species which are not possible to enroll, because it is in controversion with the Act 114/1992: Act on protection of nature and landscape with a Decree 395/1992 On threatened species. This problem was open for discussion between agricultural and

environmental sectors. Proposed species for *in situ* conservation that fell under the legislative protection currently cannot be included, because, they cannot be collected for backup to the Gene Bank and thus do not meet requirement of availability. Similarly proposed sites in protected areas cannot be included unless they are approved by AOPK. Both topics will be discussed in 2024. AOPK requested list of prioritized target species of CWR and promised agreement on species with lower level of protection (C3 and C4 plants of Red list of the Czech Republic, Grulich, 2012).

Based on the above statement we decided to exclude protected plants of the levels C1 and C2 (Grulich, 2012) and all proposed sites on protected areas mentioned in the previous reports. These sites will be included after approval of AOPK.

Overview of sites included in *in situ* conservation in the Czech Republic in 2023

Hierochloë odorata. Red list status: C1, site: Grado – currently excluded

Hierochloë odorata. Red list status: C1, site: Václavka – currently excluded

Astragalus excapus . Red list statua C2. Site: Radobýl near Litoměřice – currently excluded

Monitoring of coastal chive sites – *Allium schoenoprasum* ssp. *schoenoprasum*. The Děčín location represents the occurrence of chives on the paved navigation of the Elbe River bank. The total coverage on the permanent area is 90-100%, of which the coverage of chives on the standard area was permanently rated as grade 3. The Shannon and Simpson index values are at medium levels. Additional chive seedlings in the number of 100-200 plants are spread around the monitored population. Despite the growing nitrification and ruderalization from the nearby sewage outlet, the chives are stabilized and, on the contrary, their abundance is increasing. Děčín's population is permanently stabilized despite the occurrence of floods.

Fig. 5, 6. Locality Děčín with monitored plot of *Allium schoenoprasum* var. *schoenoprasum*

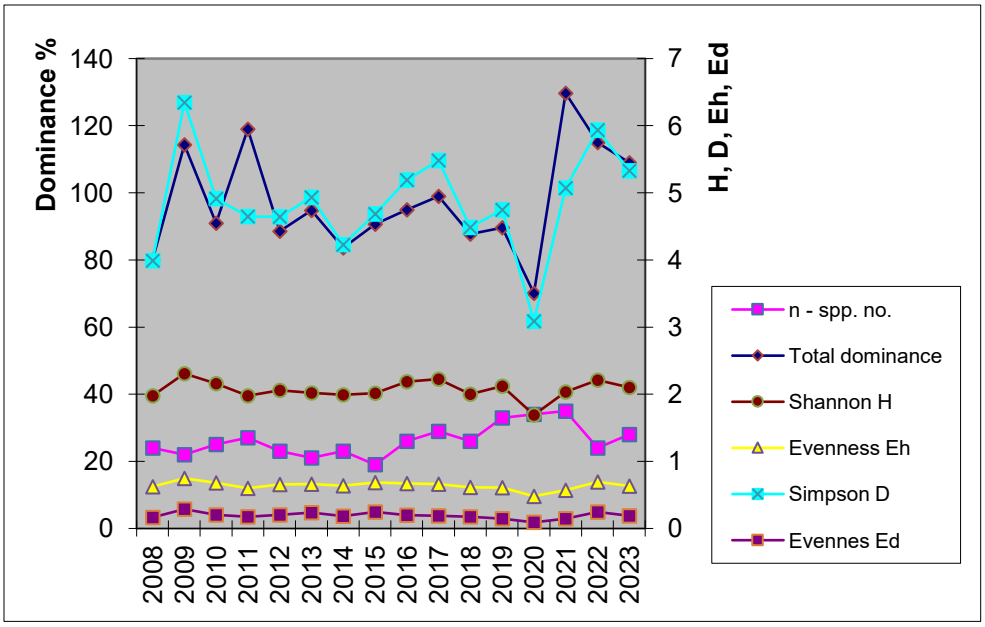


Fig. 7. Monitoring of site with *Allium schoenoprasum* var. *schoenoprasum* in Děčín, Elbe River Basin Phytosociological relevés (n- number of spp, TD – total dominance, Shannon Index, Evennes Shannon, Simpson index, Evennes Simpson)

The occurrence of chives near Zbraslav along Vltava River was first recorded in 2001. In 2002 and 2006, floods affected the locality, which almost destroyed it. Genetic diversity was greatly depleted by subsequent bank restoration. Since 2008, the residual population has been monitored. Another population on the opposite river bank was taken for monitoring since 2022.This population belonging to the village Horní Břežany – Jarov is distributed in rocky pavement of the bank in the length of ca 50 m. It is very viable and stabile for many years and will be used for *in situ* conservation.

Fig. 8. Locality Zbraslav with monitored plot of *Allium schoenoprasum* var. *schoenoprasum*

Fig. 9. Locality Jarov with monitored plot of *Allium schoenoprasum* var. *schoenoprasum*

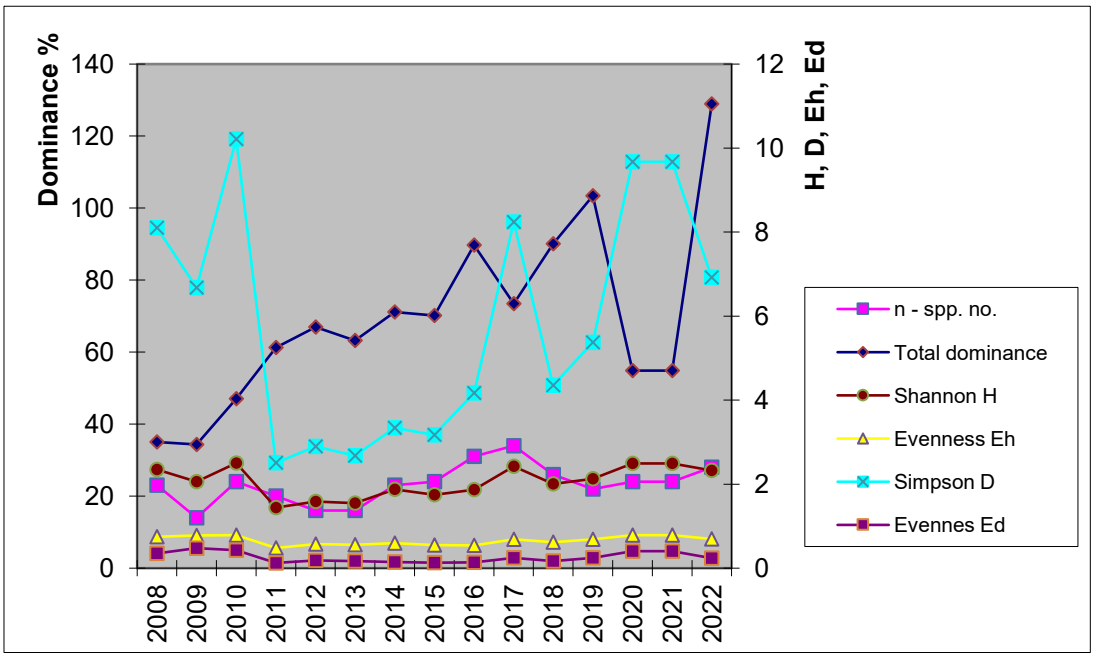


Fig. 10. Monitoring of site with *Allium schoenoprasum* var. *schoenoprasum* in Zbraslav, Vltava River Basin Phytosociological relevés (n- number of spp, TD – total dominance, Shannon Index, Evennes Shannon, Simpson index, Evennes Simpson)

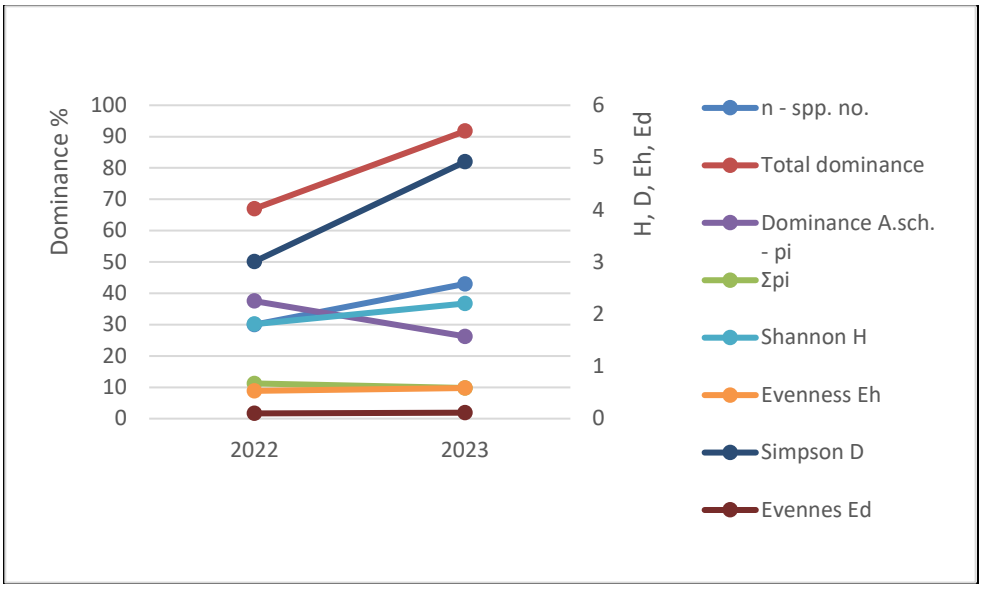


Fig. 11. Monitoring of site with *Allium schoenoprasum* var. *schoenoprasum* in Horní Břežany - Jarov, Vltava River Basin Phytosociological relevés (n- number of spp, TD – total dominance, Dominance of A. schoenoprasum, Shannon Index, Evennes Shannon, Simpson index, Evennes Simpson)

Monitoring of *Aegilops cylindrica* – excluded in 2023

The locality of *Ae. Cylindrica* is on railway bridgehead to Branický Bridge, in Chuchle district, southern part of Prague. The railway body was made of limestone gravel brought from Czech Karst in 1960ies. Together with limestone there were introduced karst species, therefore it is botanically interesting place. *Ae. cylindrica* was introduced by rail in 1980ies and now it is well naturalized. The site is a stripe with a size is 50 x 4 m. The vegetation consists of mainly ephemeric species, phytosociological relevé is shown in the Table 2. Botanical diversity is low reflecting ecologic conditions of gravel embankment with quite high value of Shannon and Simpson indices. The population of *Ae. cylindrica* counted several hundred individuals in 2022. In August the bridge was taken to reconstruction and the gravel with plants was excavated. Currently we have to wait if the population recovers from the sides.

Fig. 12, 13, 14. Locality Prague - Chuchle with monitored plot of *Aegilops cylindrica* in 2022

Fig. 15. Locality Prague - Chuchle with damaged plot of *Aegilops cylindrica* in 2023

Table 2. Summary of phytosociological relevé of *Ae. cylindrica* site in bridgehead to the Branický Bridge, Prague – Chuchle.

	2020	2021	2022	2023
3	0	0	0	Not evaluated
2a	0	0	1	
2m	0	0	2	
1	6	7	4	
plus	8	7	6	

r	0	0	0
n - spp. No.	14	14	13
Total dominance	16	18.2	29.35
Shannon H	2.007	2.109	1.919
Evenness Eh	0.76	0.799	0.748
Simpson D	6.643	7.559	5.681
Evennes Es	0.474	0.54	0.437

Monitoring of hop - *Humulus lupulus*

Wild hop is distributed along rivers, and locally in forest margins and in secondary vegetation around villages. Responsibility for the hop collection is in the Hop Institute Žatec, curator Vladimír Nesvadba**.** He monitors distribution of hop in Jeseníky Mts. N Moravia (Fig.). The monitoring sites are inside and outside of Protected Landscape Area (PLA) Jeseníky. Several sites are also on private land. Selected suitable sites were negotiated for *in situ* conservation with private owners. Negotiations have already started also with PLA headquarters. All hop sites are monitored by crop curator in the Hop Institute Ltd., which will serve also as liaison institution.

Fig. 16. PLA Jeseníky Mts. And marked sites of wild hop (*Humulus lupulus*) on the border of PLA

Fig. 17, 18. Sites of wild hop (*Humulus lupulus*) outside of PLA Jeseníky Mts.

Monitoring of *Glycyrrhiza glabra* site

Glycyrrhiza glabra was cultivated in the past from 18th to beginning of 20th century. These plantations dissappeared except one naturalized population, currently in Natural Reserve (NR) Pouzdřany steppe. The population is distributed along the border, partly within and partly ouside the NR. This is very positive situation, because it may be possible avoid collecting of seeds for Genebank within NR. Another suitable site of *Glycirrhiza glabra* was selected on vinyard teraces in Popice, suburbs of Brno, near raiway station.

In addition, a natural hybrid of *C. fruticosa (Cerasus* x *eminens*) is occureed in the NR Pouzdřany steppe. It may be a good source of genes for breeding. It is now a well naturalized population for about 50 years counting ca 10 individuals. This site is a very hot candidate for in situ conservation after approval of AOPK in 2024.

Fig. 19, 20, 21. The site of Glycirhiza *glabra* in NR Pouzdřany Steppe

Fig. 22, 23. The site of natural hybrid of sour cherry *Cerasus* x *eminens* in NR Pouzdřany Steppe

The next selected sites are from the group of forage plants: *Trifolium fragiferum, T. retusum, Medicago minima* and *Chamaecitisus virescens*. They are distributed as scattered populations in steppes of S Moravia and also disturbed habitats nearby the protected areas. They have been monitored by Research institute of fodder plants Troubsko, which will serve as Liaison institution.

References

Alercia, A., López, F., Marsella, M., and Cerutti, A.L. (2021) Descriptors for Crop Wild Relatives conserved in situ (CWRI v.1). Rome, FAO on behalf of the International Treaty on Plant Genetic Resources for Food and Agriculture. https://doi.org/10.4060/cb3256en

Botany.cz, 2023. BOTANY.cz | Zajímavosti ze světa rostlin. Katalog rostlin s vyhledáváním jednotlivých druhů. Rezervace, chráněná území a jiné významné botanické lokality. Ohrožené a chráněné druhy rostlin.

Chytrý M., Danihelka J., Kaplan Z., Wild J., Holubová D., Novotný P., Řezníčková M., Rohn M., Dřevojan P., Grulich V., Klimešová J., Lepš J., Lososová Z., Pergl J., Sádlo J., Šmarda P., Štěpánková P., Tichý L., Axmanová I., Bartušková A., Blažek P., Chrtek J. Jr., Fischer F. M., Guo W.-Y., Herben T., Janovský Z., Konečná M., Kühn I., Moravcová L., Petřík P., Pierce S., Prach K., Prokešová H., Štech M., Těšitel J., Těšitelová T., Večeřa M., Zelený D. & Pyšek P. (2021) Pladias Database of the Czech Flora and Vegetation. – Preslia 93: 1–87.

Chytrý M., Tichý L., Dřevojan P., Sádlo J. & Zelený D. (2018) Ellenberg-type indicator values for the Czech flora. – Preslia 90: 83–103.

Grulich V. 2012. Red list of vascular plants of the Czech Republic. https://botany.cz/cs/cerveny-seznam/.

Hédl R. (2005). Sledování změn vegetace [Study of changes in vegetation]. In: Vačkář D. Ukazatelé změn biodiversity (Indicators of vegetation changes). Academia Praha, pp. 171—194.

Kaplan Z. Klíč ke květeně České republiky [Key to the flora of the Czech Republic]. Academia Praha, 2021, 1168 s.

Maxted N, Avagyan A, Frese L, Iriondo JM, Magos Brehm J, Singer A, Kell SP. 2015. ECPGR Concept for in situ conservation of crop wild relatives in Europe. Wild Species Conservation in Genetic Reserves Working Group, European Cooperative Programme for Plant Genetic Resources, Rome, Italy.

Pladias: Database of the Czech flora and vegetation

Procházka F. 2001. Černý a červený seznam cévnatých rostlin České republiky

Taylor N.G., Kell S.P., Holubec V., Para-Quijano M., Chobot K. & Maxted N. (2017): A systematic conservation strategy for crop wild relatives in the Czech Republic. Diversity Distrib. 23:448-462.

Hintum van T., Iriondo J. 2022. Principles for the Inclusion of CWR Data in EURISCO. ECPGR (www.ecpgr.cgiar.org/).

Weise, S., Kreide, S. and Maxted, N. (2020) Concept for a possible extension of EURISCO for in situ crop wild relative and on-farm landrace data. https://more.bham.ac.uk/farmerspride/wp-content/uploads/sites/19/2021/09/D2.5_EURISCO_in_situ_extension_concept.pdf

Wild J., Kaplan Z., Danihelka J., Petřík P., Chytrý M., Novotný P., Rohn M., Šulc V., Brůna J., Chobot K., Ekrt L., Holubová D., Knollová I., Kocián P., Štech M., Štěpánek J. & Zouhar V. (2019) Plant distribution data for the Czech Republic integrated in the Pladias database. – Preslia 91: 1–24

Zedek V., Křížková I., Kosová M., Holubec V., Mátlová V., Komínek P., Papoušková L., Novotný D., Janovská D. 2017. Národní program konzervace a využívání genetických zdrojů rostlin, zvířat a mikroorganismů významných pro výživu a zemědělství na období 2018-2022. MZe Praha, 53 s.