BDEE 2021
The 1st International Electronic Conference on Biological Diversity, Ecology and Evolution
15–31 MARCH 2021 | ONLINE
Chaired by PROF. DR. MICHAEL WINK
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Changes in soil seed bank and vegetation at abandoned bait sites in a Central European hilly area

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Abstract: Feeding places for shooting wild boar (ie., bait sites) may cause weed infestation in natural habitats. We examined the vegetation and the soil seed banks of three current and three – 1, 8 and 10 years old – abandoned baits, using vegetation survey along transects and seedling emergence methods. In case of vegetation, the density and the number of weeds were significantly higher at current baits. In addition, the abundance of weeds decreased with the time of abandonment, but the number of weeds remained similar. Concerning the seed bank, the species number and the total seed density highly varied, but due to the frequent disturbances, they were lower at current baits. Only the proportion of weed species was significantly lower at abandoned sites, the abundancy of weed seeds was similar, and did not decrease in time. Even, the youngest bait showed the lowest, while the oldest one the highest proportion of weed seeds among the abandoned sites. Generally, long-term persistent seeds dominated, except for the oldest site, indicating the lower level of disturbance. Vegetation regenerates relatively quickly, but the seed banks remain infected for years, which can be a potential source of secondary invasions.

Keywords: bait site; soil seed bank; abandonment; weed invasion; regeneration

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Introduction

- The effects of wild game feeding have been widely investigated:
  - especially in the northern countries;
  - little has been done in Hungary due to the lower importance of winter feeding.
- However, feeding places shooting wild boar (so-called bait sites) are spreading.
- Previus study: bait sites can cause significant weed invasion, especially at clearing sites (Rusvai et al. 2019).

The **regeneration after abandonment** and the **soil seed bank** of bait sites are unknown.

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Baits from Mátra Mountain….

and things that I have found there…

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Material and methods

We selected 3 current and 3 (1, 8 and 10 years old) abandoned bait sites in the Mátra Mountain, in Hungary.

Vegetation: 4 transects arranged from the center of the baits; each consisting of 22 1m^2 tangential quadrats; coenological survey (percentage cover) was conducted.

Soil seed bank: 12 plots of 10×10×5 cm, in the centre of the bait sites; seedling emergence method was used.

The survey was carried out in May and August 2019.

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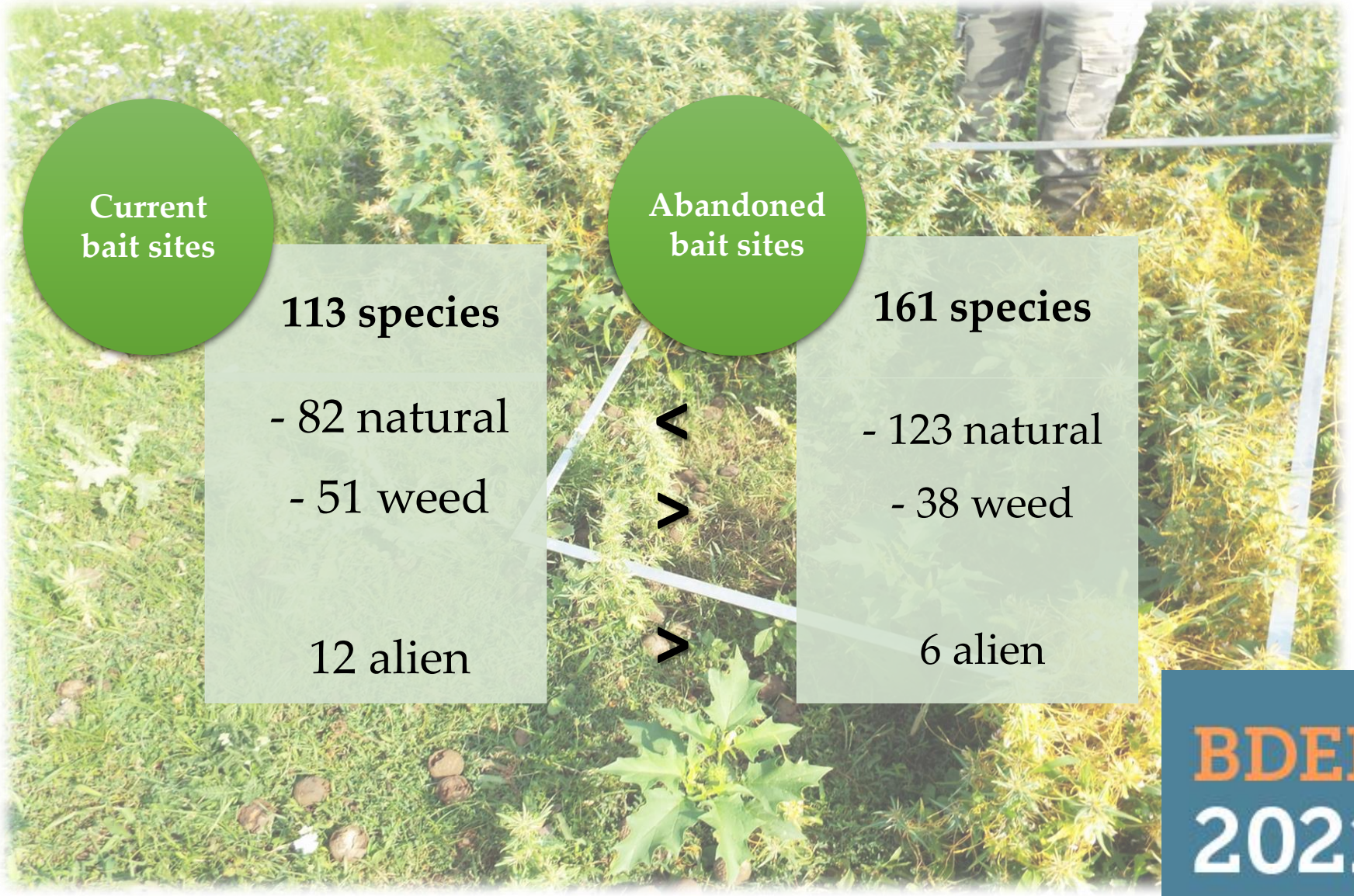
Results and Discussion

1. Vegetation composition



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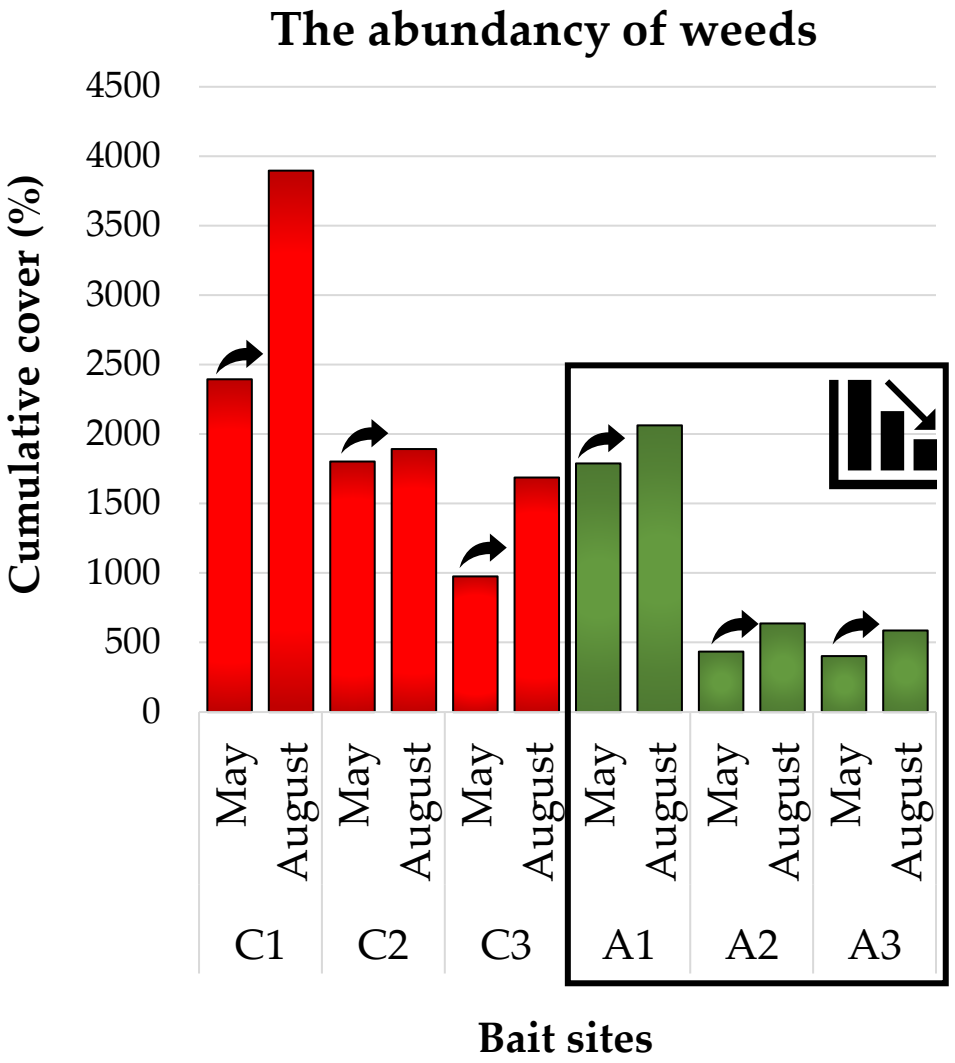
1. Vegetation composition



- The cumulative cover and the proportion of weed species were significantly **higher** at current bait sites.
- The cumulative cover of weeds **decreased** with the time of abandonment.
- The abundance of weeds was higher in all cases in August than in May.

C1, C2, C3: current bait sites
A1: bait abandoned for 1 year
A2: bait abandoned for 8 years
A3: bait abandoned for 10 years

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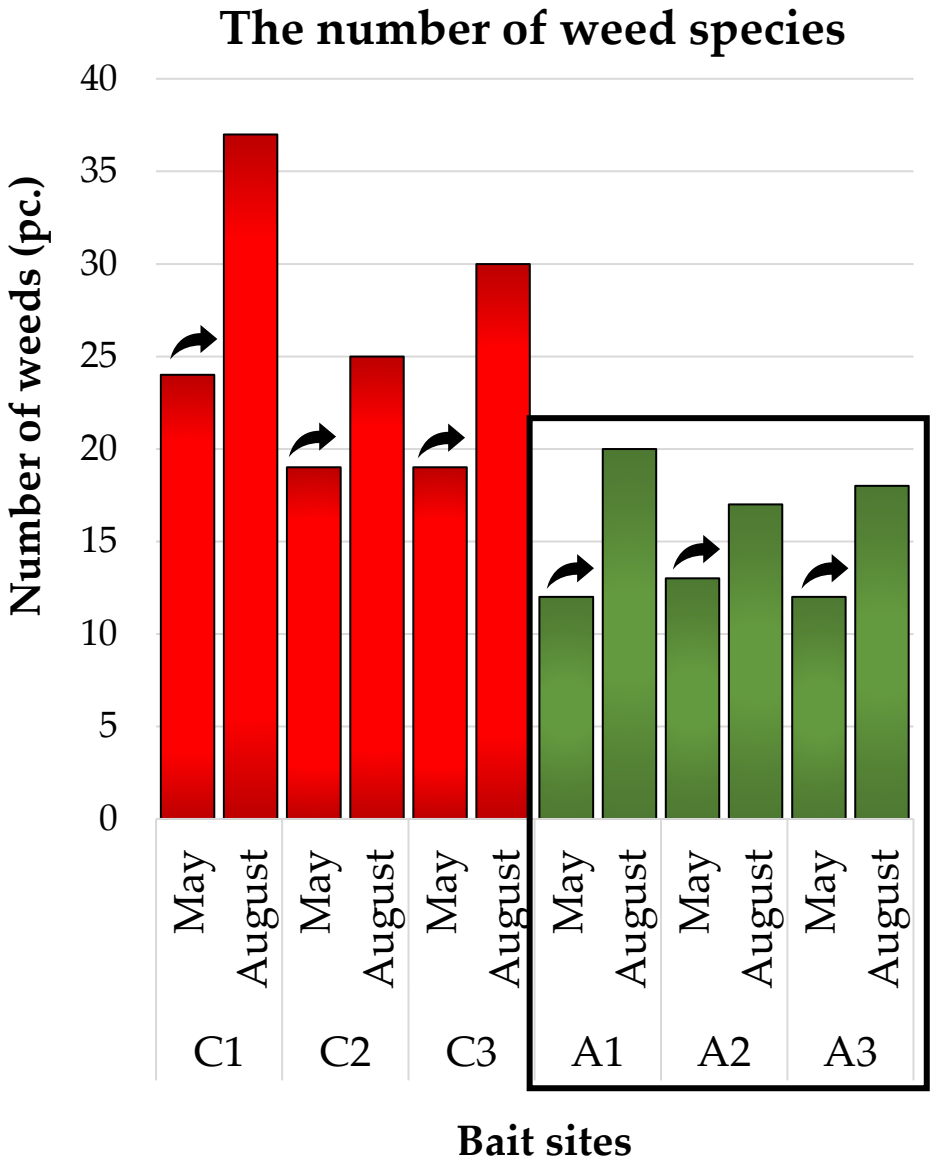
1. Vegetation composition



- The number and the proportion of weeds were significantly **higher** at current bait sites.
- The number of weeds remained **similar**, did not decrease with the time of abandonment.
- Only the number of ruderal competitor (RC) species was significantly lower at abandoned sites.
- The number of weeds was higher in all cases in August than in May.

C1, C2, C3: current bait sites; A1: bait abandoned for 1 year; A2: bait abandoned for 8 years; A3: bait abandoned for 10 years

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2. Spatial distribution of weeds

- Significant changes was mostly detected in the **center** of the baits.
- Differences mainly in the number of the weeds, especially between the **youngest (A1)** and the **oldest (A3)** sites.
- The cover of weeds differed between the 1-year-old and the two older sites, the latter two (A2-A3) were very similar.

Cover of weeds																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A1 – A3	*	**					**				*	*										
A1 – A2	*	**	*	*	*		*															
A2 – A3		*																				

Number of weeds																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A1 – A3	**	***	**	**	*		*				***	***	*									
A1 – A2		**										*										
A2 – A3		***		**																		

A1: bait abandoned for 1 year; A2: bait abandoned for 8 years; A3: bait abandoned for 10 years

*** : highly significant (p<0,001);
** : moderately significant (p<0,01);
* : poorly significant (p<0,05)

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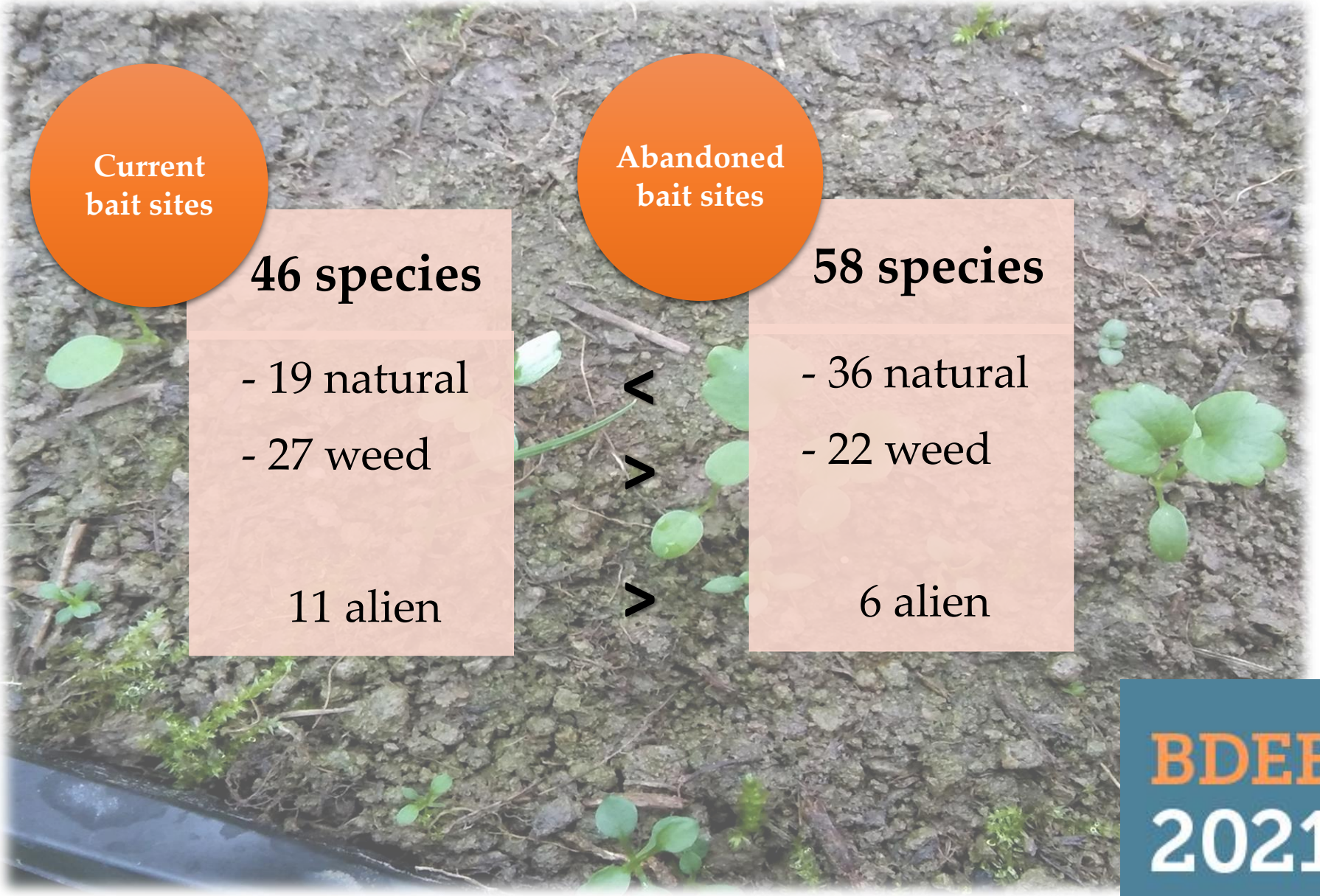
3. Soil seed bank composition



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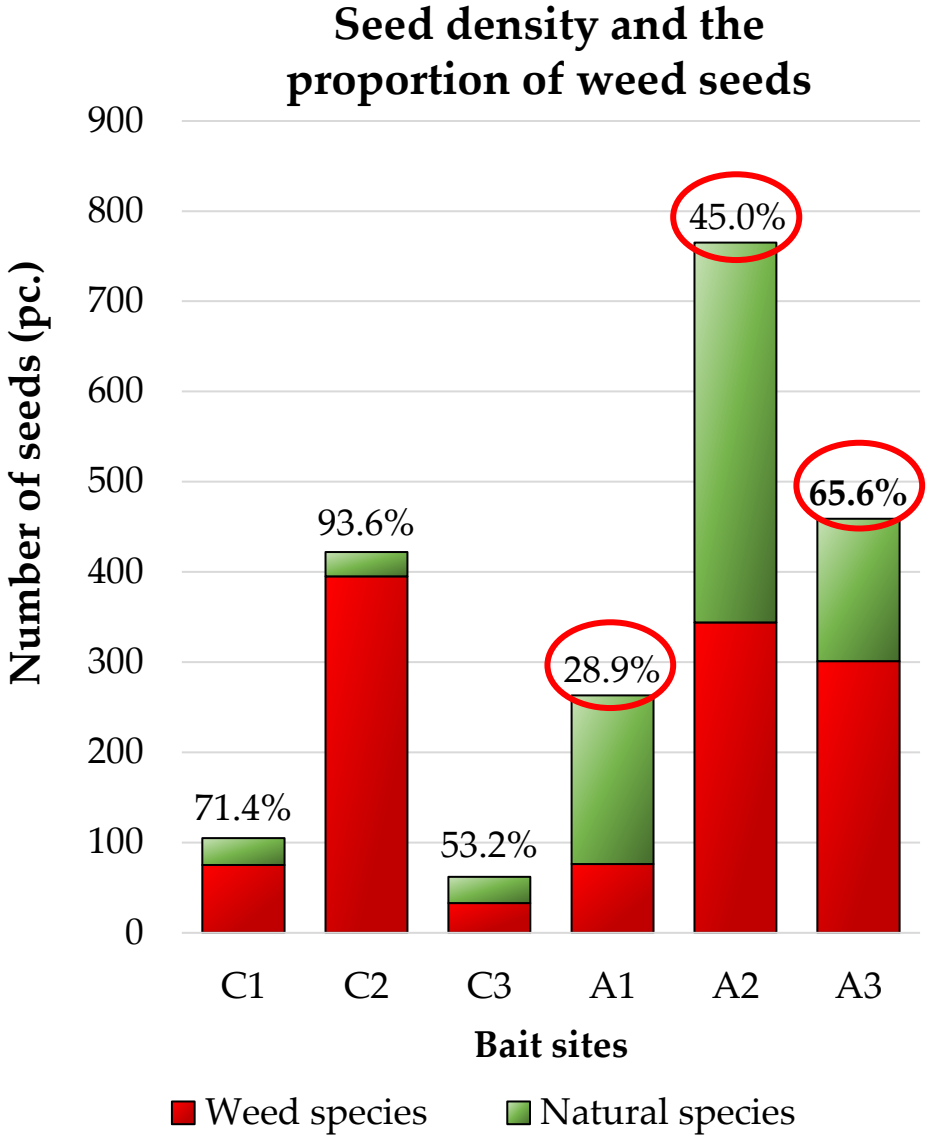
3. Soil seed bank composition



- The total seed density was very variable, but in general it was lower at current baits.
- The abundancy of weed seeds was similar to or sometimes even higher, than at current baits.
- The abundance of weed seeds did not decrease with the time. Even, the youngest bait had the lowest and the **oldest** had the **highest proportion of weed** seeds among the abandoned sites.

C1, C2, C3: current bait sites; A1: bait abandoned for 1 year; A2: bait abandoned for 8 years; A3: bait abandoned for 10 years

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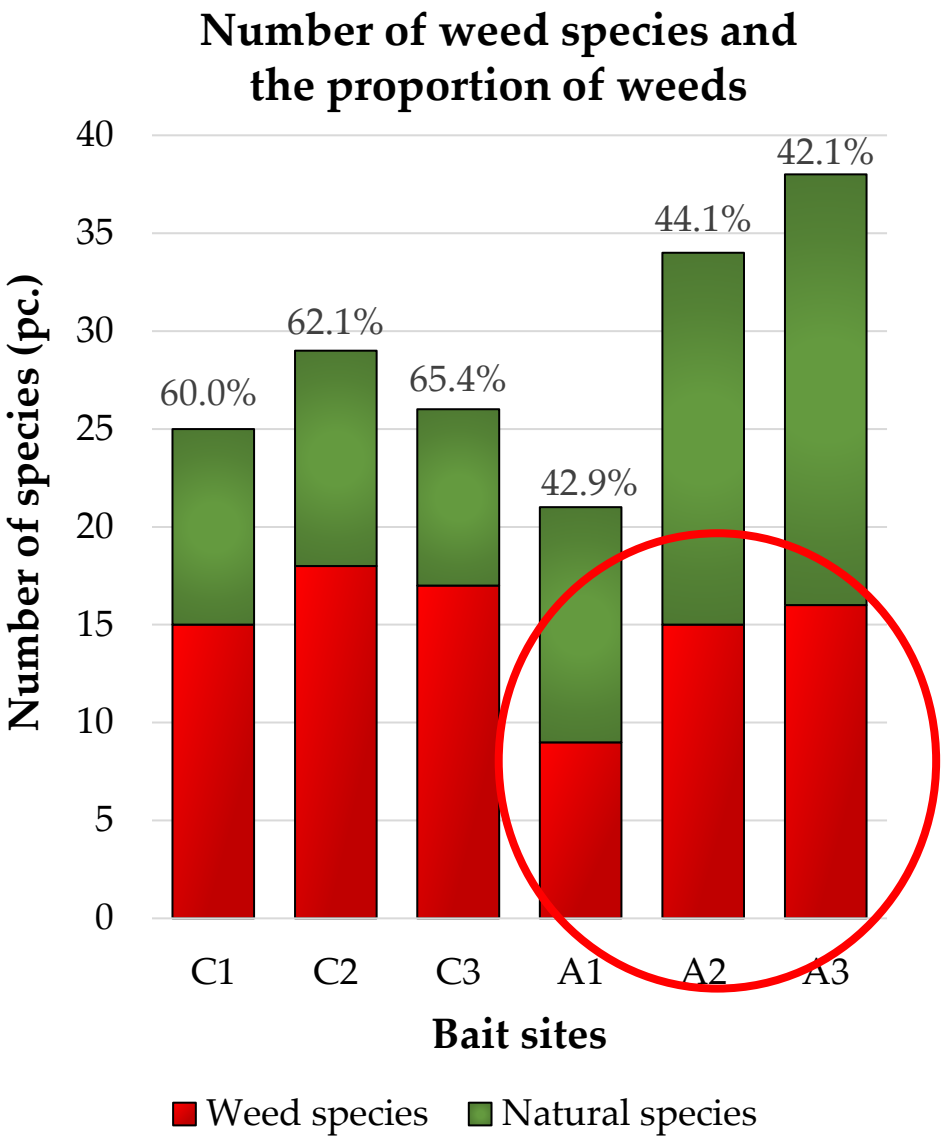
3. Soil seed bank composition



- The species number was also very variable, but in general it was lower at current baits.
- Only the proportion of weed species was significantly lower at abandoned sites.
- The number of weed species did not decrease with the time: it was the highest at the oldest abandoned bait.
- The proportion of weeds remained very similar between the different aged abandoned baits (42.9%, 44.1% and 42.1%).

C1, C2, C3: current bait sites; A1: bait abandoned for 1 year; A2: bait abandoned for 8 years; A3: bait abandoned for 10 years

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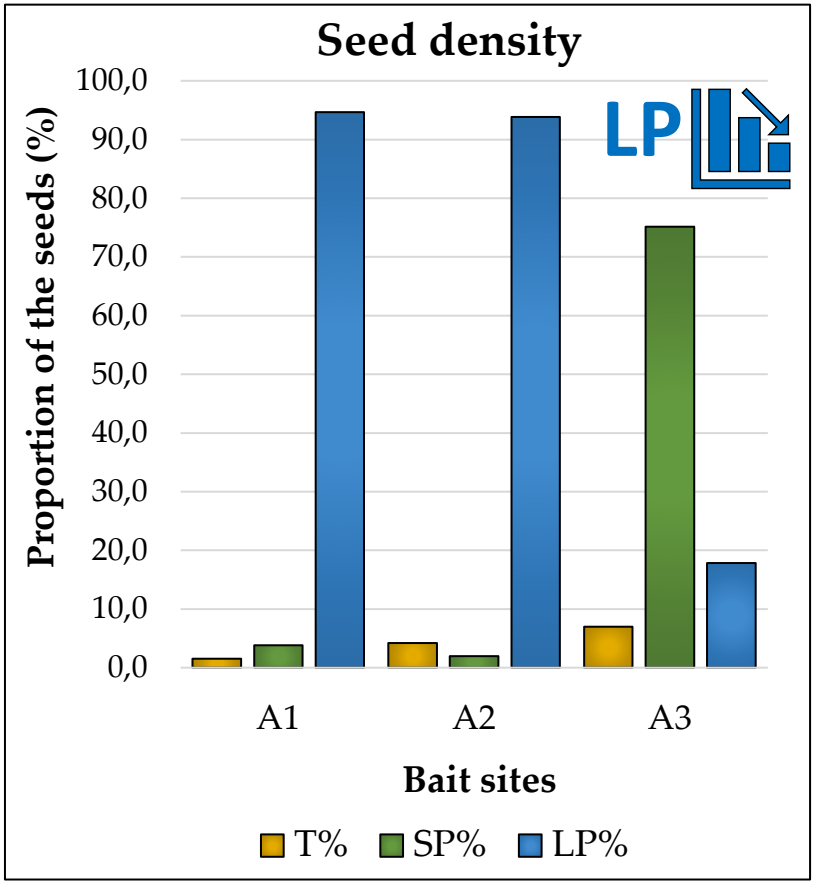
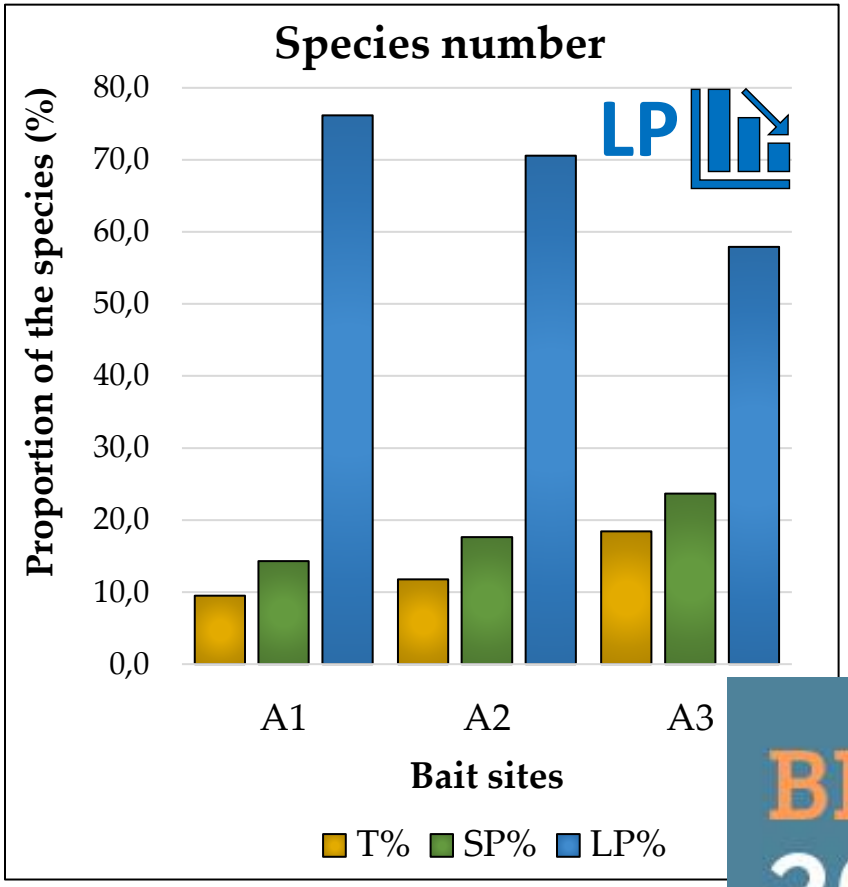
4. Seed bank persistence

- Long-term persistent seeds dominated in all cases.
- At abandoned sites it remained high, but **decreased** with the time.
- The proportion of T and SP species and their seed density increased, especially at the oldest abandoned site (A3).





T: transient, SP: short-term persistent, LP: long-term persistent
A1: bait abandoned for 1 year; A2: bait abandoned for 8 years; A3: bait abandoned for 10 years

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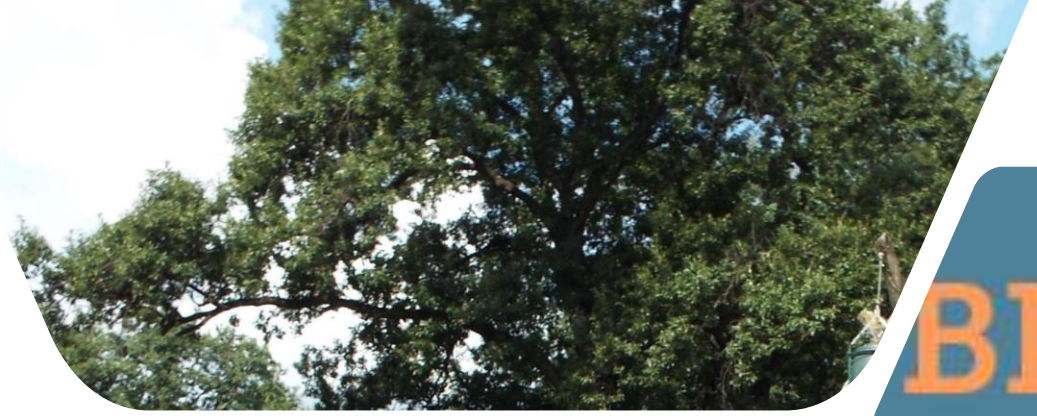
Conclusions

- **Vegetation regenerate** relative **quickly**, as studies have shown examining the regeneration of abandoned fields in Eastern Europe.
- It is most likely due to the presence of semi-natural grassland patches in the surroundings, that serve as **propagule sources**.
- Similarly other studies, we showed that the weed cover decrease relative quickly, but the **number of weed species did not decrease** with the time.
- **The reasons:**
  - in the soil seed bank weed seeds could remain viable for decades;
  - the animals often return to the bait sites after abandonment, soil disturbances may promote the germination of remained weeds;
  - the soil nutrient enrichment caused by the accumulated forages creates favorable conditions for weeds.
- **Final conclusion:** the presence of weeds may facilitate invasion by additional species and according to *'invasional meltdown hypothesis'*: it can cause secondary invasions as it is proved in many studies.
- **The future:** the chronosequence method is sufficient to make general trends for conservation goal, but a multi-year monitoring could provide more detailed information.



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