

# **Monitoring of Conservation Status of Wolves in Slovenia in 2020-2021 season**

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## **FINAL REPORT SUMMARY**

### **BACKGROUND**

This summary reports the results from the »Spremljanje stanja ohranjenosti volkov v Sloveniji v sezoni 2020-2021« Project (Monitoring of Conservation Status of Wolves in Slovenia in 2020-2021 season). This is the fourth such project financed by the Slovenian Ministry of the Environment and Spatial Planning. The methods used in the project were developed under the LIFE SloWolf project (LIFE08 NAT/SLO/000244) and are described in detail in the Action plan for sustainable management of the wolf (*Canis lupus*) population in Slovenia for the period 2013 – 2017. This report includes the results of wolf monitoring for the season 2020/2021. The fieldwork connected with noninvasive sample collection started in May 2020 and lasted one year (until the end of April 2021). The wolf howling survey was carried out in August 2021.

### **METHODS**

We used multiple methods including established field-based protocols, laboratory tests, and quantitative methods to provide a holistic approach to wolf population monitoring in Slovenia.

With the **howling method for detection of wolf litters** we systematically surveyed the entire wolf range in Slovenia. Due to the natural expansion of the wolf population to the Alpine and pre-Alpine regions of Slovenia in 2019 the survey quadrant net was expanded to this part of the country. In the 2020/2021 season the survey area in the Alpine and Pre-Alpine part of Slovenia has been extended by 113 quadrants, thus ensuring the possibility of systematic detection of the wolf litter occurrence across the entire area of permanent wolf presence in Slovenia. The current census grid for the systematic acoustic detection of territorial wolves and pups through howling survey thus comprises 605 3x3 km quadrants within which the forest covers more than 65% of their area. The howling survey was carried out in August 2021

Field collection of noninvasive genetic samples was carried out between 1st of May 2020 and 30th April 2021. During this period, we collected 470 noninvasive genetic samples (304 scat samples, 127 urine samples, 32 saliva samples collected on natural wolf prey, 5 hair samples and 2 blood samples). Besides noninvasive genetic samples we also analyzed 8 tissue samples of dead wolves, one saliva sample collected from dead wolf (table I) and 6 blood or saliva samples collected during the wolf capturing for telemetry. In the final estimate of the wolf population size and social structure we also included all working genetic samples (N = 44) of wolf saliva from livestock damages (genotipisation of these was financed through the public service). Altogether we gathered 317 working wolf samples. Based on the results of genetic analyzes, we estimated the size of the Slovenian part of the wolf population (mark-recapture method) and analyzed kinship relationships between animals.

Table I: Dead wolves, inspected in the period from 1. 7. 2020 – 30. 6. 2021.

Št.	LUO	Hunting ground	Date	Sex	Body weight (kg)	Age estimate	Type of mortality	Remarks
1	Zahodno visokokraško	Čepovan	19. 7. 2020	F	38,2	3+	Loss	Illegal killing
2	Notranjsko	Nova vas	4. 9. 2020	M	19	0+	Loss	Roadkill
3	Primorsko	Gradišče - Košana	24. 9. 2020	F	25	3+	Loss	Illegal killing
4	Notranjsko	Pivka	15. 11. 2020	F	25	0+	Loss	Roadkill
5	Kočevsko-Belokranjsko	LPN Medved	21. 11. 2020	F	21	0+	Legal cull	Prevention of serious damage
6	Gorenjsko	LPN Kozorog Kamnik	6. 3. 2021	F	32,0	5+	Legal cull	Prevention of wolf-dog hybridization
7	Kočevsko-Belokranjsko	Mala Gora	23. 3. 2021	F	27,0	1+	Loss	Roadkill
8	Gorenjsko	LPN Kozorog Kamnik	30. 3. 2021	M	24,0	1+	Legal cull	Wolf-dog hybrid
9	Primorsko	Prem	3. 5. 2021	F	35,0	2+	Loss	Alleged illegal killing

## RESULTS

For the season 2020/2021, we estimate that there are **12 wolf packs in Slovenia, 2 of which we share with Croatia**. Five wolf packs were assessed as vital, four had "emerging" status, one "disintegrating" status and two "unknown status". This season results also indicate the disappearance of two wolf packs, which were still monitored in the 2019/2020 season. In addition, we have 18 wolves outside the territories of confirmed packs - eight immigrants of unknown pedigree, 10 dispersers with known pedigree.

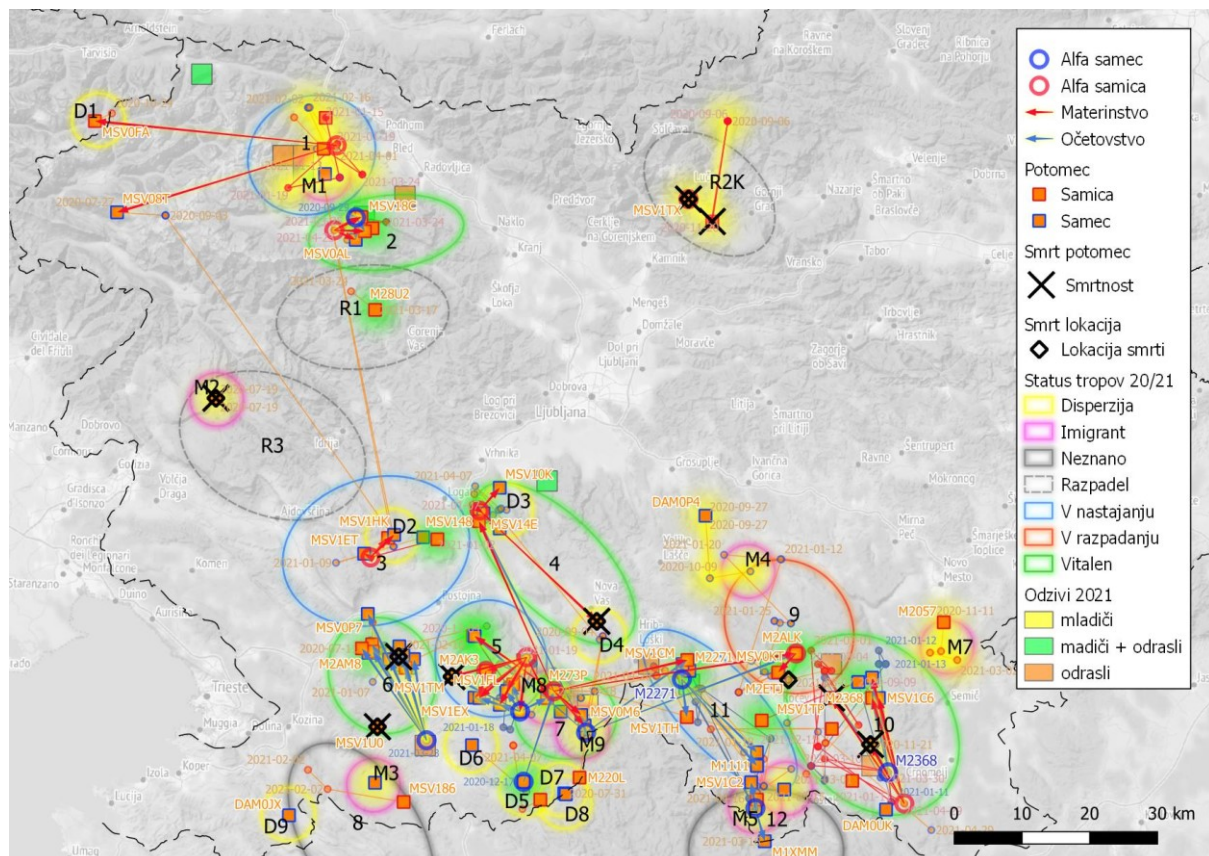


Figure I: Family connections (pedigree) of wolves in the sampling season 2020/21, presumed pack territories, and tagged dispersers / immigrants. Pack territories are made on the basis of the locations of members of each pack, but are of a purely indicative nature.

The entire superpopulation, including all wolves detected in transboundary packs, was estimated at around 138 individuals (121–168, 95% confidence interval) but through the genotypes we detected 96 unique individual wolves 54 males and 42 females. Since the estimated average size of the wolf pack in Slovenia is around 6 wolves, and since 13 of the immigrants/dispersers are detected close to the border with Croatia and 5 elsewhere, all these 18 wolves will be considered as three additional packs, of which two are transboundary. According to the methodology from the previous years 4/15 (25 %) of the population are considered as cross-border animals.

Also in accordance with the previous years' practice, half of the estimated cross-border animals are subtracted from the estimated population for management purposes. Thus, **in the season 2020/2021, we have 120 (106-147) wolves for management purposes (after correction for cross-border animals) in Slovenia.**

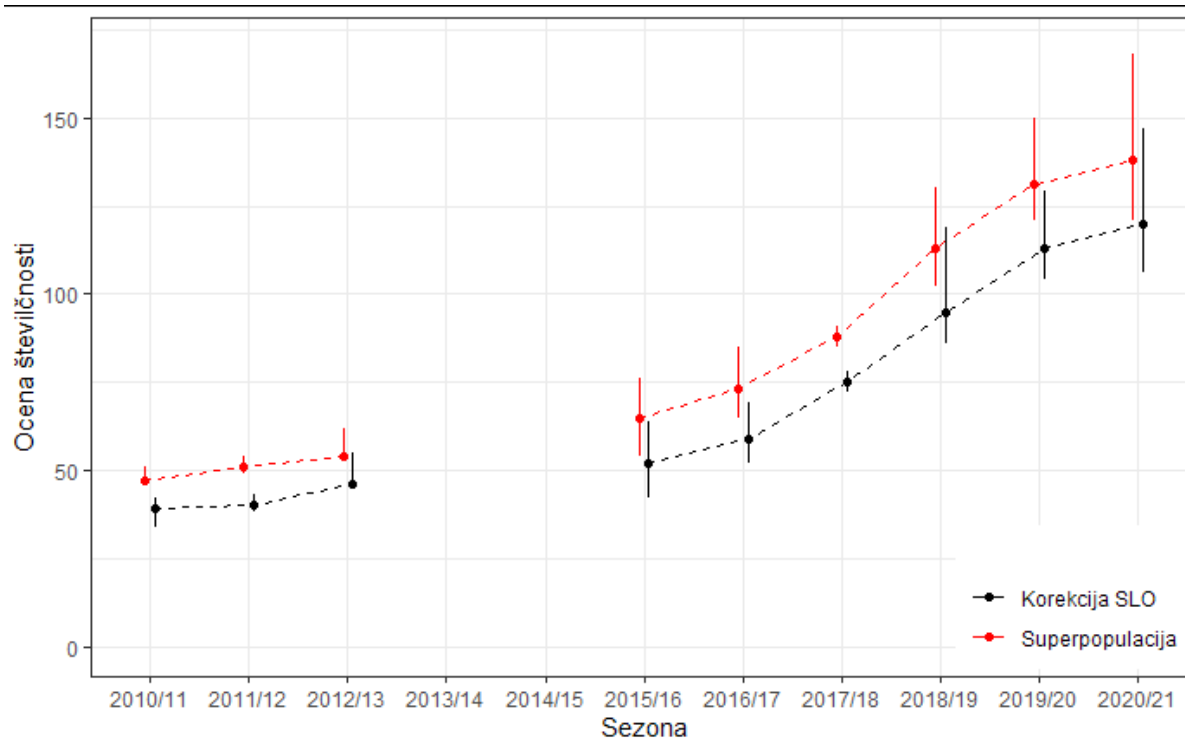


Figure II: Multi-year dynamics of the wolf population in Slovenia. The points are mean population size estimates, the vertical lines indicate a 95% confidence interval.

During the howling survey we detected wolves in 14 quadrants. **Eight quadrants included the responses of pups.**

In the last decade, the wolf population in Slovenia has increased significantly. It seems that wolf abundance in Slovenia is now at the point where chance and mortality of each individual are becoming less important for defining the species conservation status. The wolf population shows a constant positive dynamic in both abundance and spatial characteristics, as it has been increasing and expanding spatially since 2010, ever since we have quality monitoring data. In this season we have two packs with “unknown” status and nine with active statuses (“vital” or “emerging”). Besides that, the population trend is still positive although it seems that population growth is slowing down. **The conservation status of the wolf in Slovenia can therefore be classified as favourable.** Over the last three seasons, the situation has changed considerably in the Alpine region of the wolf range, where we now also have vital packs.

In the monitoring season 2020/2021 two packs (Trnovski gozd 2016 and Gotenica 2016) disappeared without the recorded mortality of the reproductive animal. Furthermore, in the Pokljuka 2019 and Suha Krajina 2019 pack we noticed the disappearance of one of reproductive animals. Given the increase in the number of recorded cases of illegal killing of wolves (e.g. both wolves that we telemetrically monitored during the 2019/2020 season fell under the shot of a poacher) we are concerned that there may be an increase in illegal cull in the population. Illegal killing is very difficult to prove and even more difficult it is to catch the culprit, so it is difficult to put more than speculation on the 'disappearance' of packs, but even if we consider only the recorded cases of illegal wolf killing, the current situation is worrying.

Due to recurrent sampling, we can continue to monitor population dynamics. Because of differences in sampling intensity some estimators in the table II can be over or underestimated, nevertheless we

get the overall picture of the population dynamics. The population shows remarkable dynamics that have been recorded since 2010.

*Table II: Population dynamics table. Estimates are based on the actual detected animals, not model abundance. Based on the reconstructed pedigree, we divided the total population growth into reproduction and immigration.*

Above diagonal: no. of animals in  
season Y caught again in season X.

Sez. X Sez. Y	15/16	16/17	17/18	18/19	19/20	20/21	Total animals	Loss	Growth	Immigra- tion	Reproducti- on	Nett
15/16	49	15	13	8	6	2	49					
16/17	4	51	31	18	13	6	66	30 (61.2%)	51 (104.1%)	4 (7.8%)	47 (92.2%)	21 (42.9%)
17/18	2	3	53	38	26	13	87	31 (47%)	53 (80.3%)	3 (5.7%)	50 (94.3%)	22 (33.3%)
18/19	1	1	4	44	38	19	85	44 (50.6%)	44 (50.6%)	8 (18.2%)	36 (81.8%)	0 (0%)
19/20	0	0	1	2	67	37	110	41 (48.2%)	67 (78.8%)	5 (7.5%)	62 (92.5%)	26 (30.6%)
20/21	0	0	0	0	0	57	96	37 (33.6%)	57 (51.8%)	8 (14%)	49 (86%)	20 (18.2%)
Missed in season X	0	4	4	5	2	0	Diagon- al: no. of first catch					

Under diagonal: no. of animals from  
the season X, not caught in season Y,  
but caught later.

Wolf-dog hybridisation remains a concern. Although the wolf crossing with dogs on Velika Planina was culled, there are new reports of potential hybrids in the Alps at the end of this season. We believe that in order to ensure the long-term protection of the wolf population in Slovenia, it is necessary to remove confirmed wolf-dog hybrids from the population, which is extremely difficult. Nevertheless, we propose to continue removing hybrids and potential hybrids, as the introduction of dog genes into the wolf population is a much greater threat to the wolf population than potential culling errors.

## CONCLUDING REMARKS

All wolf monitoring data indicate that wolf conservation in Slovenia is successful, but it is possible that population growth is slowing down. Monitoring continues to provide a sound scientific basis for the management and protection of wolves in Slovenia. The multi-year and consecutive monitoring projects allow us to know the structure of Slovenian wolf packs on a "personal" level for several generations and to understand in detail the social structure, abundance and long-term dynamics of the population. Although most pedigree determinations, which are the main method for an in-depth understanding of population dynamics, are spatially and temporally meaningful this season, the number of individuals in the study is beginning to outstrip the statistical power of the set of genetic markers we are using. We will need to expand the set of genetic markers in the coming years.

Crossbreeding with dogs remains a problem that we will have to tackle seriously. Although it is not as widespread as in some neighbouring countries, the problem must be addressed with all seriousness. Since we have been monitoring the growth and spatial expansion of the population since 2010, we can non the less make a strong case for a favourable conservation status.

However, it should be remembered that the total number of wolves in Slovenia is by far too small for

the long-term viable population, so it is crucial to maintain connectivity with other Dinaric wolves in Croatia, Bosnia and Herzegovina and Alpine wolves in Italy, Austria in order to maintain a favourable conservation status. In this sense, we should not forget about the fences at the border with Croatia and make sure that they do not cause isolation of the "edge" populations of large mammals in Slovenia.