Monitoring of Conservation Status of Wolves in Slovenia in 2015/2016 – Summary in English

The report shows the results of the project »Spremljanje varstvenega stanja volkov v Sloveniji v sezoni 2015/2016« (Monitoring of Conservation Status of Wolves in Slovenia in 2015/2016). The methods used in the project were developed within the project LIFE SloWolf (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 2013 – 2017 period. The fieldwork (sample collection, tracking of occurrence and predation data) started in July 2015 and lasted one year (until the end of June 2016), in line with the reproductive biology of wolves.

In the project we combined different field, laboratory and mathematical/computing approaches to provide holistic population monitoring.

We used the **howling method for detection of wolf litters** to systematically survey the entire wolf range in Slovenia. The area was divided into 3 × 3 km quadrants, and all quadrants where forest covers more than 65% of the quadrant were surveyed. Altogether we surveyed 418 quadrants, or 3762 km^2. Most of the survey was done in August 2015. We recorded 18 wolf responses, and seven of these included responses of pups that confirmed wolf litters.

We monitored **wolf mortality** and recorded seven dead wolves (Table I). All dead wolves were examined by a veterinarian. The results indicate a healthy wolf population - no serious contagious diseases were detected (e.g. canine distemper, parvovirosis, Aujeszky's disease or TBC), and none of the important zoonoses (e.g. rabies or Echinococcus).

Table I: Examined dead wolves

No.	Area	Hunting Area	Date	Sex	Body Weight (gross)	Age Estimate	Type of Mortality	Note
1	Primorsko	Gaberk Divača	22.10.2015	m	29 kg	1+	Legal cull	
2	Zahodno visokokraško	Trnovski gozd	31.10.2015	m	43 kg	5+	Legal cull	
3	Notranjsko	Tabor Zagorje	31.10.2015	m	22 kg	0+	Legal cull	Almost hairless
4	Kočevsko-belokranjsko	Predgrad	12.11.2015	m	32 kg	1+	Legal cull	
5	Notranjsko	Prestranek	18.12.2015	m	38 kg	2+	Roadkill	
6	Kočevsko-belokranjsko	Taborska jama	26.2.2016	m	35 kg	2+	Roadkill	
7	Notranjsko	Prestranek	23.5.2016	f	39 kg	5+	Roadkill	Lactating

We also kept a record of **livestock damage cases** attributed to wolves (124 recorded). When possible, we collected a saliva sample of the predator (136 samples) to confirm the predator species using genetics. Genotyping success

was low – we could reliably determine the predator species in 37.5 % of samples. Since many damages had several samples collected, we could »solve« 49.3 % or damage cases. In 74.3 % of the solved cases the perpetrator was wolf. We didn't detect domestic dogs in any of the solved damage cases. In 8.6 % of cases we detected the golden jackal (*Canis aureus*) and in 17.1 % of cases fox (*Vulpes vulpes*), however these species are scavengers and may have just fed on the carcass.

We used **genetics** to analyze 445 noninvasive genetic samples (254 scat samples, 37 urine samples from snow, 136 saliva samples from livestock damages and 21 from natural prey). We also analyzed the tissue samples of the seven registered wolf mortalities. There were many more samples than what the funding would allow to analyze, however through synergy with the LIFE WolfAlps project (LIFE12 NAT/IT/000807) which is being implemented in the Alpine Convention area we could ensure the analysis of the entire sample set, considerably improving the result. The samples were used to estimate population size through mark-recapture and social structure through parentage/sibship assignments.

There are some changes in **the spatial distribution of the population** compared to the 2010 – 2013 sampling sessions (Figure I). In the **2015/2016 season we have 11 wolf packs in Slovenia: 4 vital** (several generations of young – Gotenica, Menišija, Racna gora/Snježnik, Rog), **1 probably dissolving pack** (Javorniki south) and **5 packs that are being formed** (probably without a "mature" social structure – Javorniki north, Gomance 2, Slavnik 2, Nanos, Trnovski gozd). For **1 pack we couldn't determine the status** (Poljanska gora) since we didn't have enough samples. It seems that this pack has most of its territory in the neighboring Croatia where we didn't collect samples. In many packs we were able to confirm litters (reproduction) through howling tests both in 2015 and 2016 (the latter is already from the 2016/2017 sampling season but relevant also to this report).

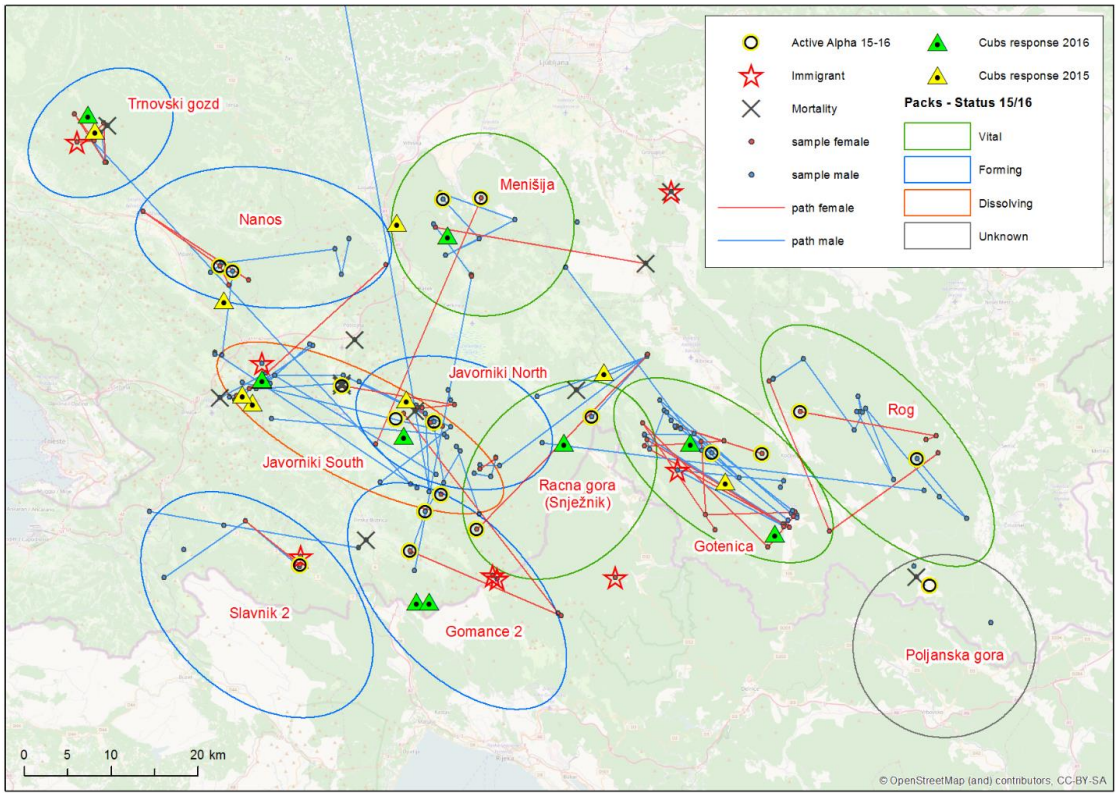

Figure I: Distribution and status of wolf packs in Slovenia in the 2015/2016 monitoring season. The male path towards north is from a young male from the Javorniki South pack that dispersed to the pre-Alpine area of Jelovica in early 2016.

In the period since the last monitoring session in 2012/2013, we lost the packs Slavnik 1 (the area is currently occupied by the pack Slavnik 2, which is another family line), Suha krajina (there is no indication of presence of territorial pack in that area apart from a few dispersing animals) and Vremšica (the pack seems to have dissolved after mortality of its alpha female Tonka – also tracked through GPS telemetry - in 2012). The offspring of two of these packs (Vremšica, Slavnik 1) are successful reproductive wolves in the other newly emerged packs, but the Suha krajina pack went completely extinct in the territory of Slovenia (we don't know if any of the dispersing animals survived elsewhere).

We have four packs that we share with Croatia (Slavnik 2, Gomance, Racna gora, Poljanska Gora). A new occurrence is the Javorniki north pack, which we suspected already in 2012/2013 season (we had no confirmed reproduction/offspring at that time), which now seems to be going into the second generation. An important new occurrence is also a pack in Trnovski gozd to the west, close to the border with Italy. Although a male wolf has been shot there in October 2015 (one of the only two wolves detected in genetic sampling) and we thought that the pack has been lost, we detected a wolf litter in the area also in 2016. It will be interesting to follow the development of this west-most pack in the future.

Besides territorial or dispersing wolves from the Slovenian packs we also detected **6 dispersing individuals from elsewhere** (probably Croatia or Bosnia). We also detected a wolf-dog hybrid (sample from 2014), however according to genetic parentage assignments this animal didn't originate from the Slovenian wolf packs. A notable occurrence is also a dispersion into pre-Alpine areas of Jelovica where a young male from the 'Javorniki south' pack relocated in the beginning of 2016. There is no indication of reproduction or other wolves in the area yet.

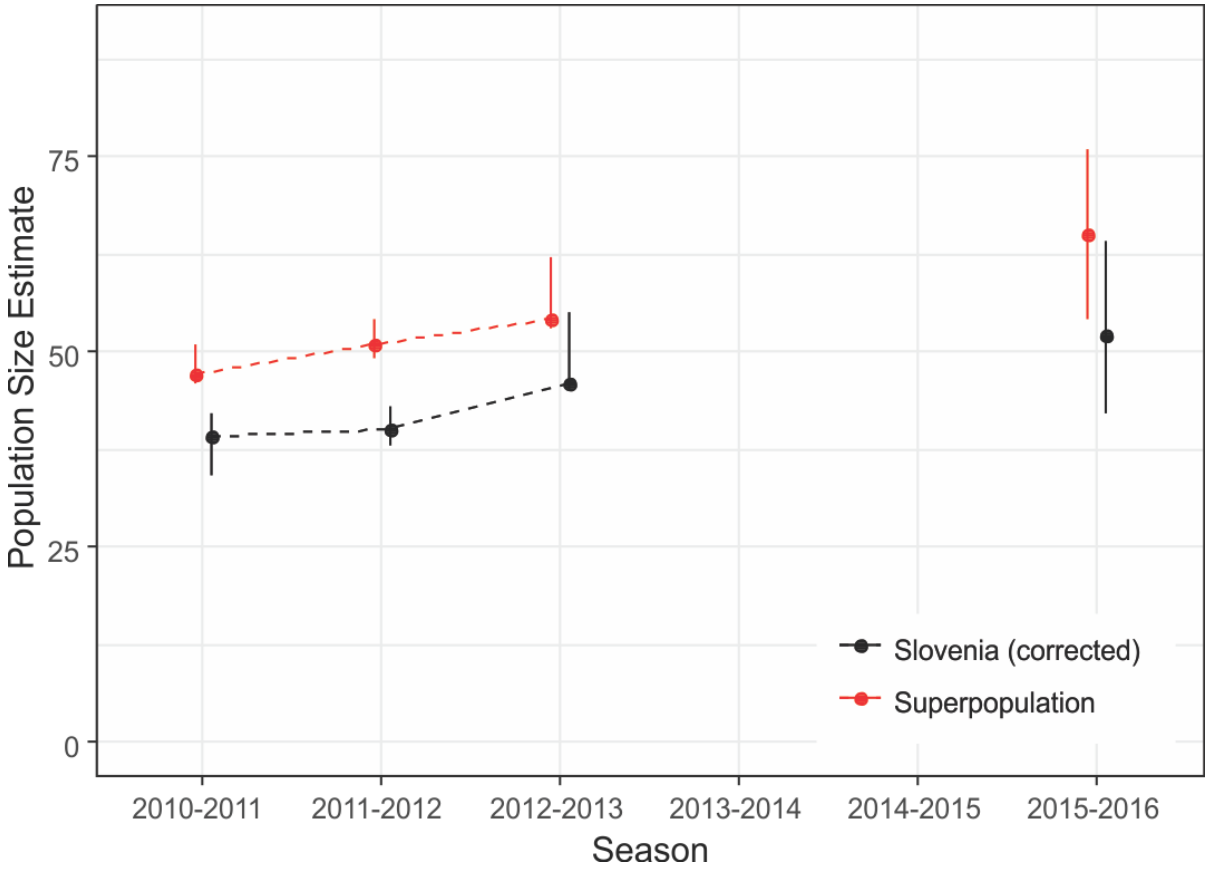

Figure II: Estimates of wolf population size in Slovenia (naïve estimates for superpopulation and corrected for transboundary packs) using noninvasive genetic sampling. Dots are point estimates, vertical lines indicate the 95% confidence intervals.

Population size seems (at least) stable compared to the previously conducted survey in 2012/2013, and increasing compared to the first season of monitoring in 2010/2011 (Figure II). The entire superpopulation (naïvely including all wolves detected in transboundary packs) was estimated at around 64 individuals (54 – 76, 95% confidence interval) through mark-recapture, and we actually detected 51 different animals (through individual genotypes). Correcting for the four transboundary packs that we share with Croatia ("assigning" a half of their estimated members to Slovenia), we can estimate **the management population size of wolves in Slovenia for the 2015/2016 monitoring season at 52 (42 — 64) individuals**.

Since hybridization with domestic dogs is a serious problem for wolf conservation, we also checked if there were any **wolf-dog hybrids** among the sampled animals. The last such animal was a male killed in 2014 in Plešivica hunting area. The animal was a F1 (first generation) hybrid. This was the fourth wolf-dog hybrid detected in Slovenia, however the previously detected hybrids were back-crosses between »pure« wolves and wolf-dog hybrids. Parentage analyses indicate that none of these animals originated from Slovenia and we didn't detect their reproduction, so in our opinion wolf-dog hybridization is still not a major problem for our wolves. However, in other research we found an extremely high hybridization rate in Dalmatia region of Croatia (35 %), which can in the long run present a considerable problem for all wolves in NW Dinaric Mountains.

Althouth the two-year »pause« of systematic monitoring prohibits us from continuing with the direct tracking of the year-to-year population dynamics in the 2015-2016 season, we are still confident that we have one of the most thorough wolf populaton monitoring systems in Europe. We know Slovenian wolf packs on the »personal« level for several generations and have a very good understanding of their social structure, abundance and long-term population dynamics. We have all the data required for cutting edge, science-supported management of this charismatic large carnivore. We must however note that **it will be difficult to keep the same quality results with the current monitoring structure and financing**. In this season the synergy with the LIFE WolfAlps project allowed us to collect and analyze almost 50% more genetic samples than we had funding for. Without this, results would be much poorer.

Since the wolf population in Slovenia is stable or even on a slight increase since 2010 when we started with the intensive monitoring, **we can consider the wolf conservation status in Slovenia as favourable**. This is especially true for the Dinaric part of the wolf range where empty territories quickly get taken up, mostly by offspring of the neighbouring packs and/or individual animals of the »old« pack that fell apart (mostly because of mortality of the alpha wolf). On the other hand in the Alpine part of the monitored area wolves are still rare, but we are observing an expansion towards west with a new reproductive pack close to Italian border in Trnovski gozd. With such a low number of animals it is difficult to talk about a conservation status (or a »population« for that matter) since the number of packs and wolves still mainly depends on chance. However, because of the expansion and constant occurence of dispersing wolves in Alpine and pre-Alpine areas, we can consider the conservation status favourable.

That said, we must not forget that the total number of wolves in Slovenia is much too low for long-term population viability, which makes maintenance of connectivity with the other Dinaric wolves in Croatia and Bosnia and Herzegovina paramount. An eye should be kept on the emerging border fences on the Croatian border, which are being constructed to direct the human migration flows. Care should be taken that these fences don't result in isolation of the »edge« populations of large mammals in Slovenia.