



Genetic monitoring of wolves in Slovenia

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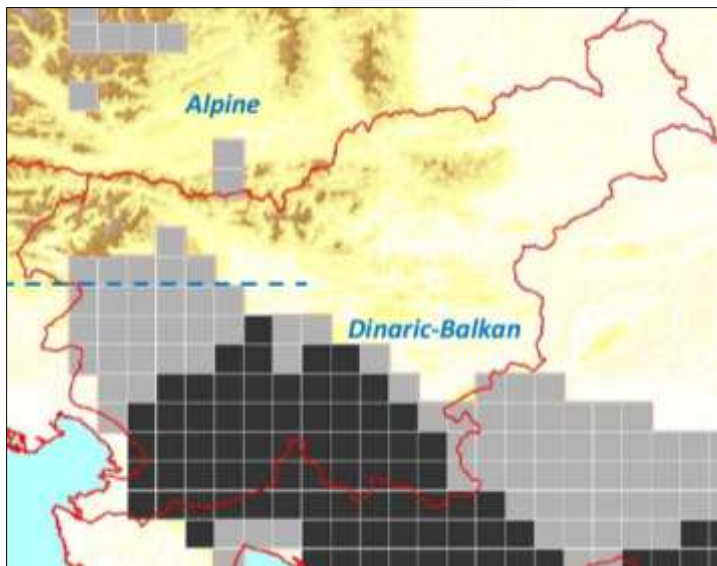


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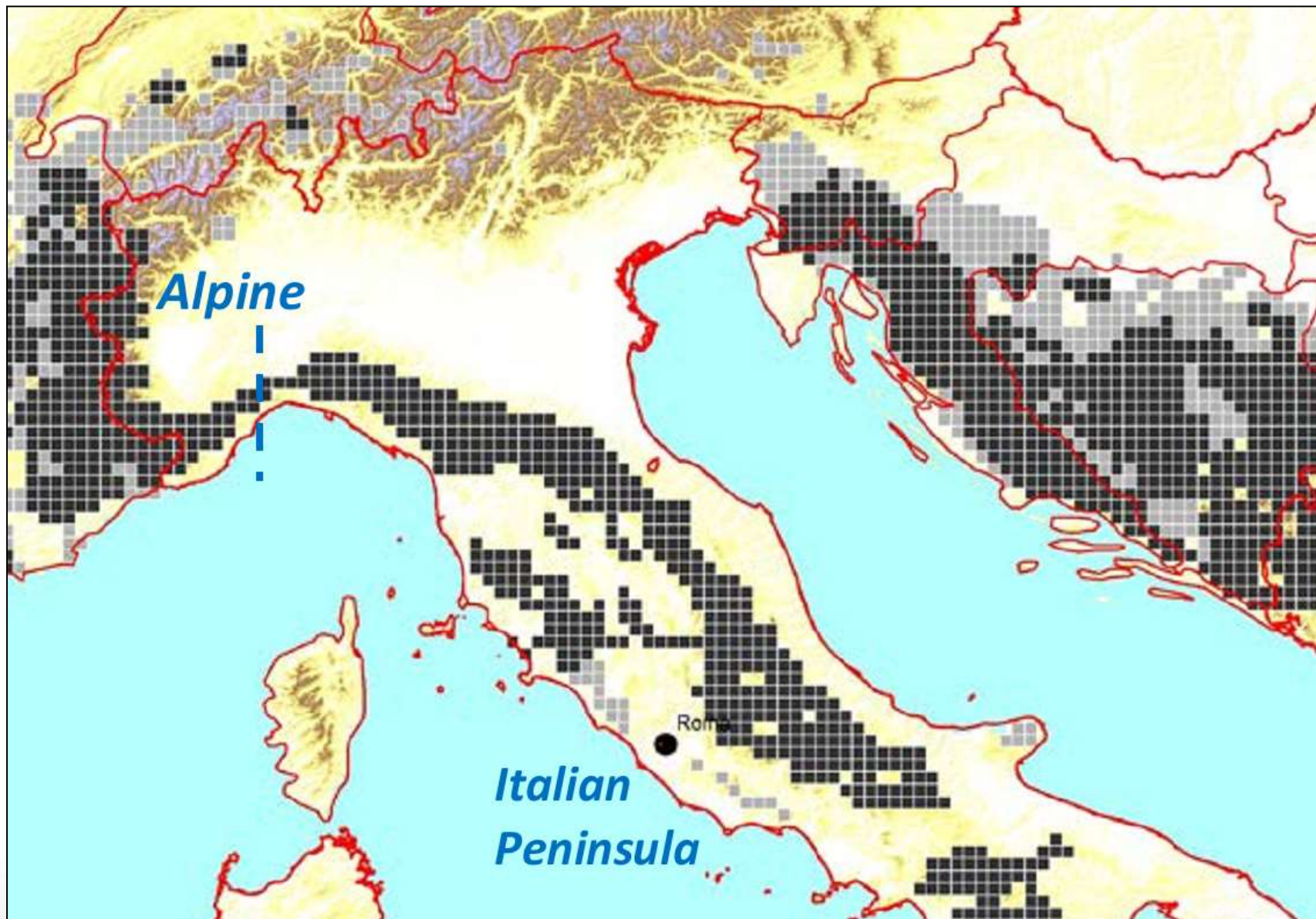
Wolves in Slovenia...

- The **NW edge of Dinaric - Balkan population.**
- On the **brink of extinction** in the first ½ of the **XX. century.**
- 1990 – **protected** by Slovenian Hunting Association.
- 1993 – **protected** by state.
- 1990's – 2000's – population **expansion.**



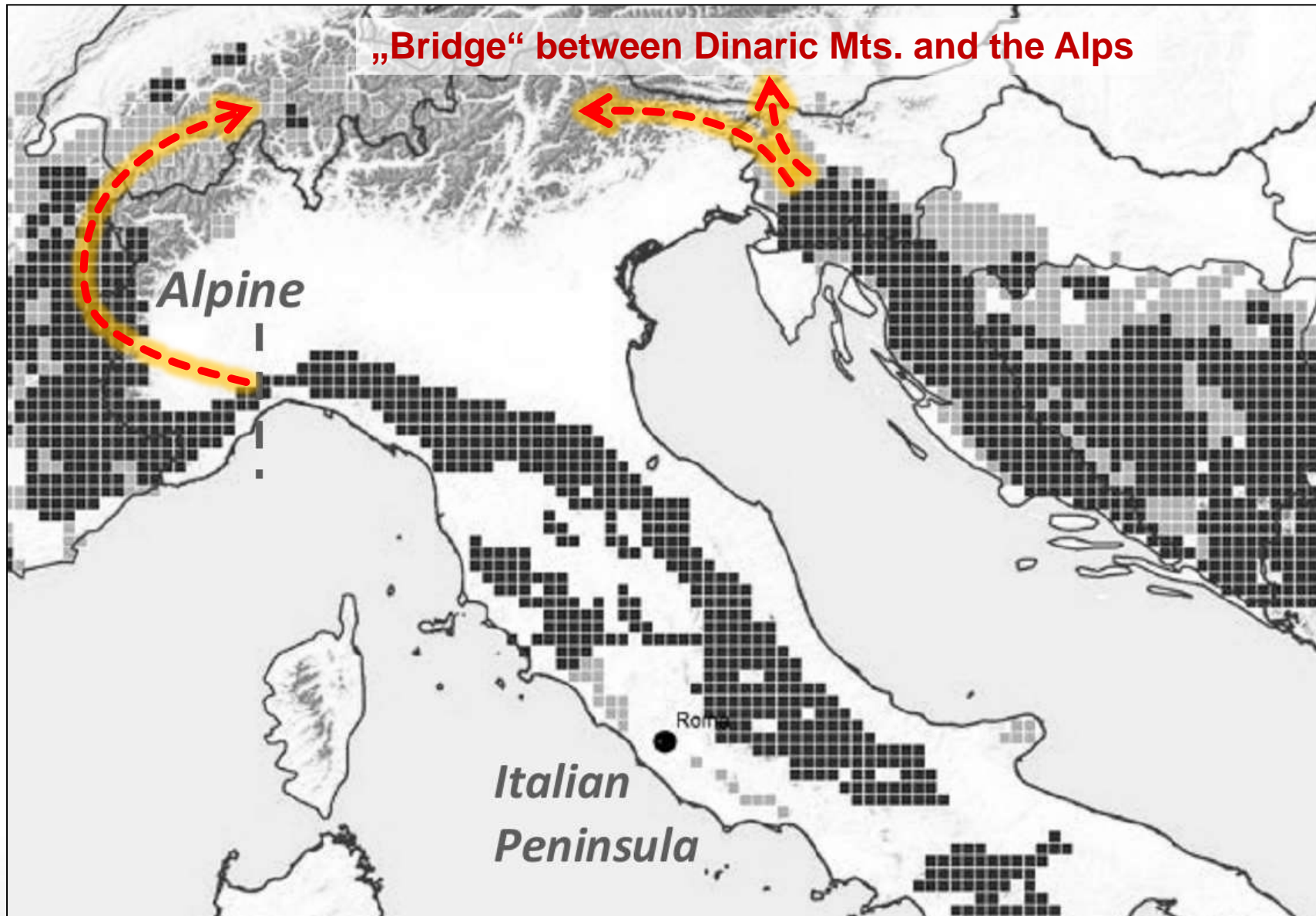
Source: Kaczensky et al. 2013, Status, management and distribution of large carnivores in Europe, LCIE.

...and their importance on the larger scale



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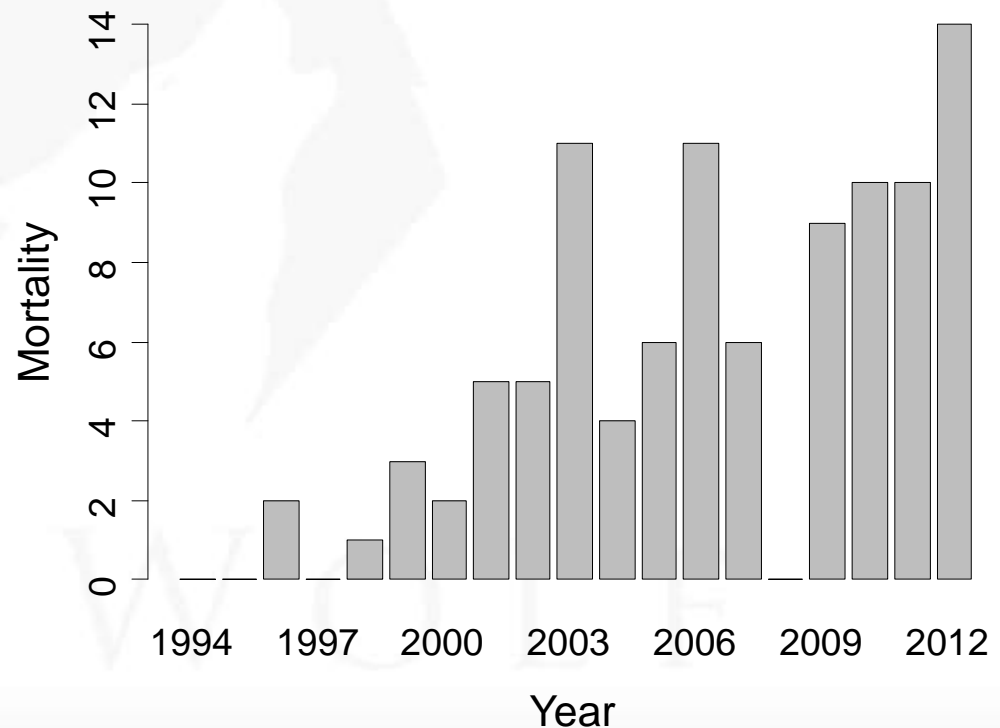
Management of the population

Considerable wolf-caused **damages**, considerable public attention.

Main **management tools**: culling, damage compensations.

A lot of **public discourse** and **pressure** by interest groups.

Detected wolf mortality in Slovenia



Research question

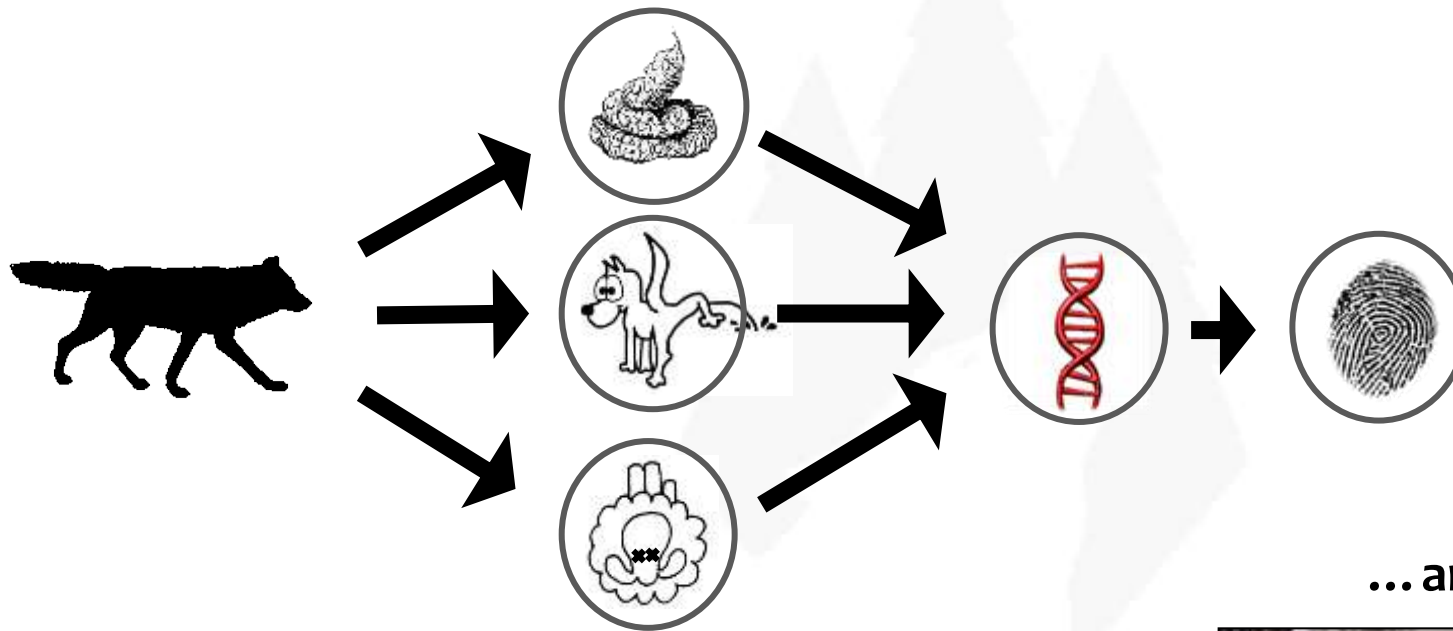
One of the basis for the management was an **assumption** of 100 wolves living in Slovenia. The actual number was **unknown**.

Question: How many wolves are there?



Material...

Noninvasive genetic samples...



...and the other kind.

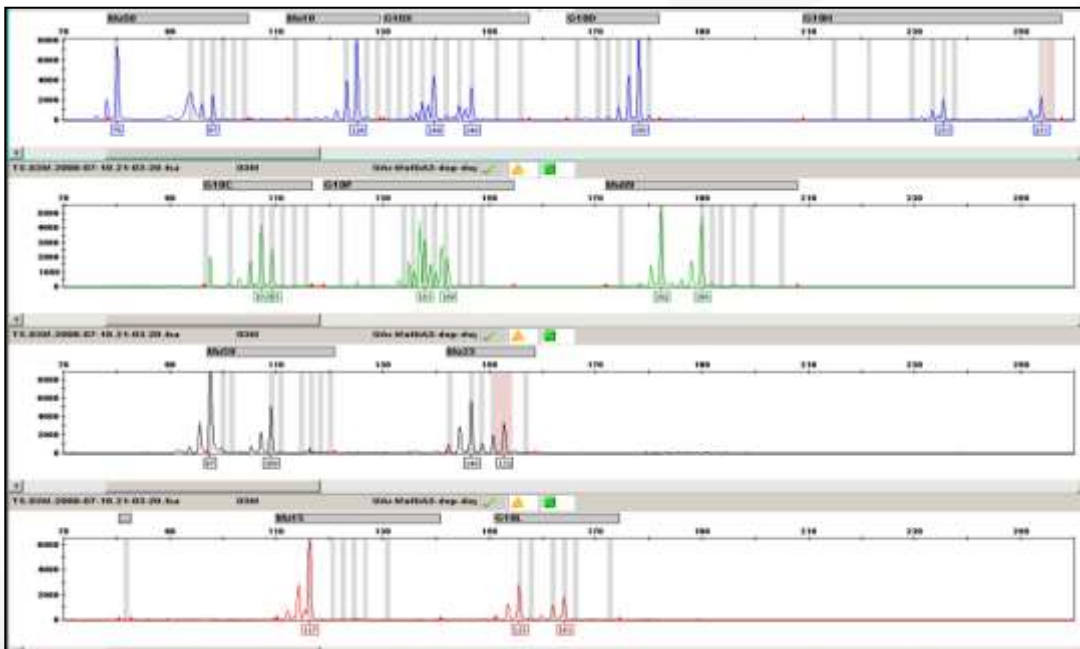


Lab stuff

Individual ID: 12-plex PCR (11 microsatellites + sex ID)

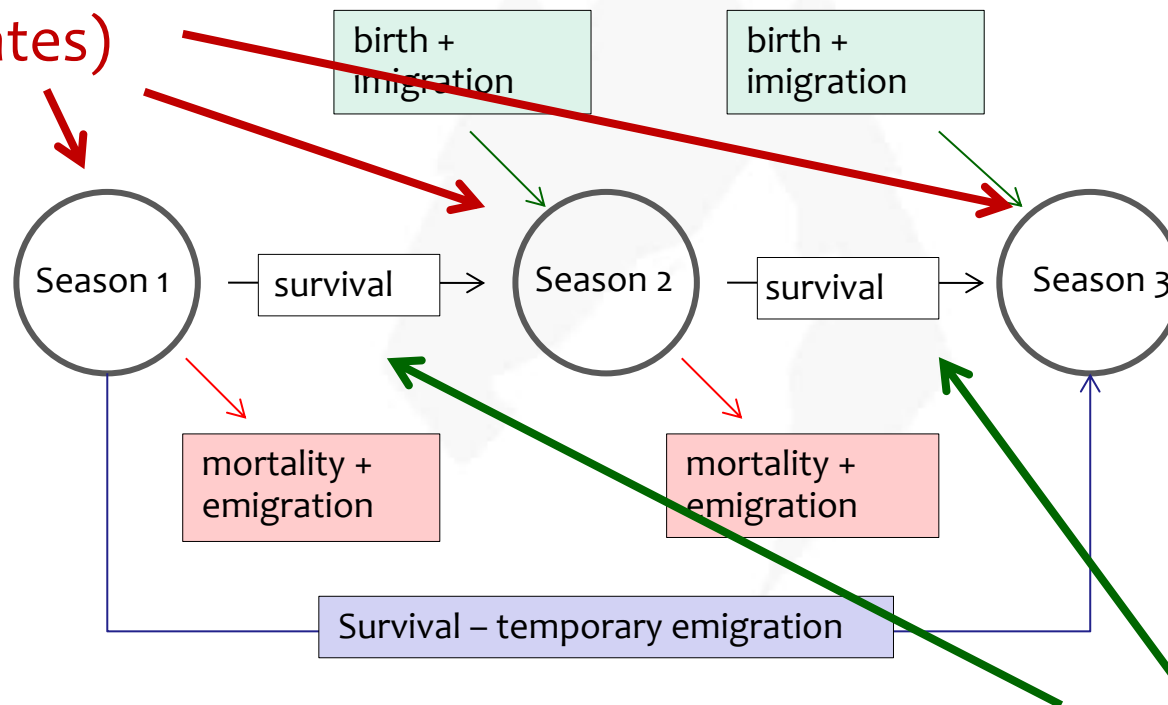
Pedigree reconstruction, hybridization detection – 35 microsats.

Very strict laboratory protocols (contamination prevention, use of barcodes, photo+video tracking of critical analysis steps)



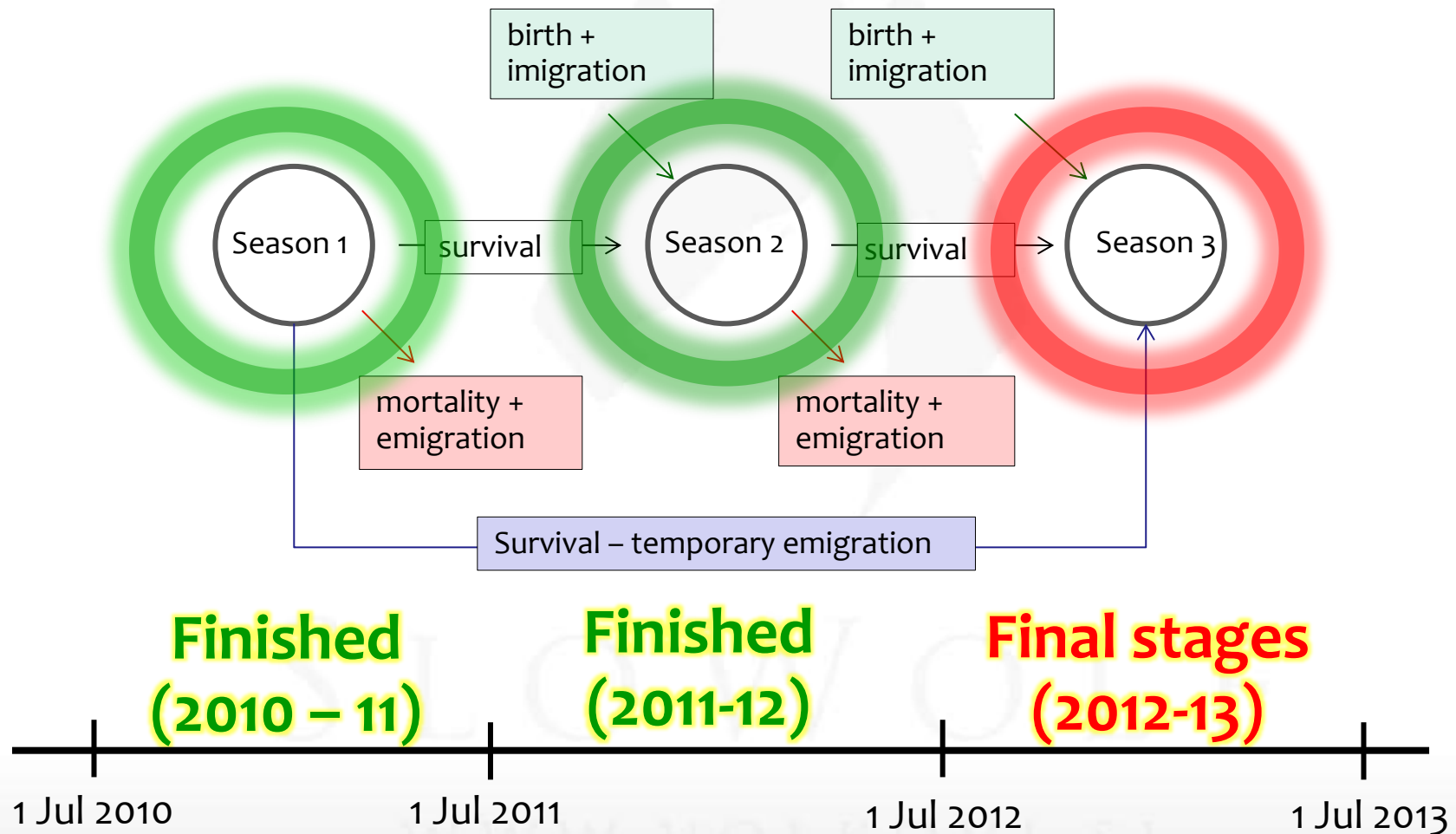
Study design

Closed population
within seasons
(abundance
estimates)



Open population
between seasons
(dynamics estimates)

Study design



Intensive sampling, large sampling network



Sampling results

General

- ~500 samples **per season**
- Good **spatial distribution** (entire area covered)
- Samples from Croatia from **transboundary packs**

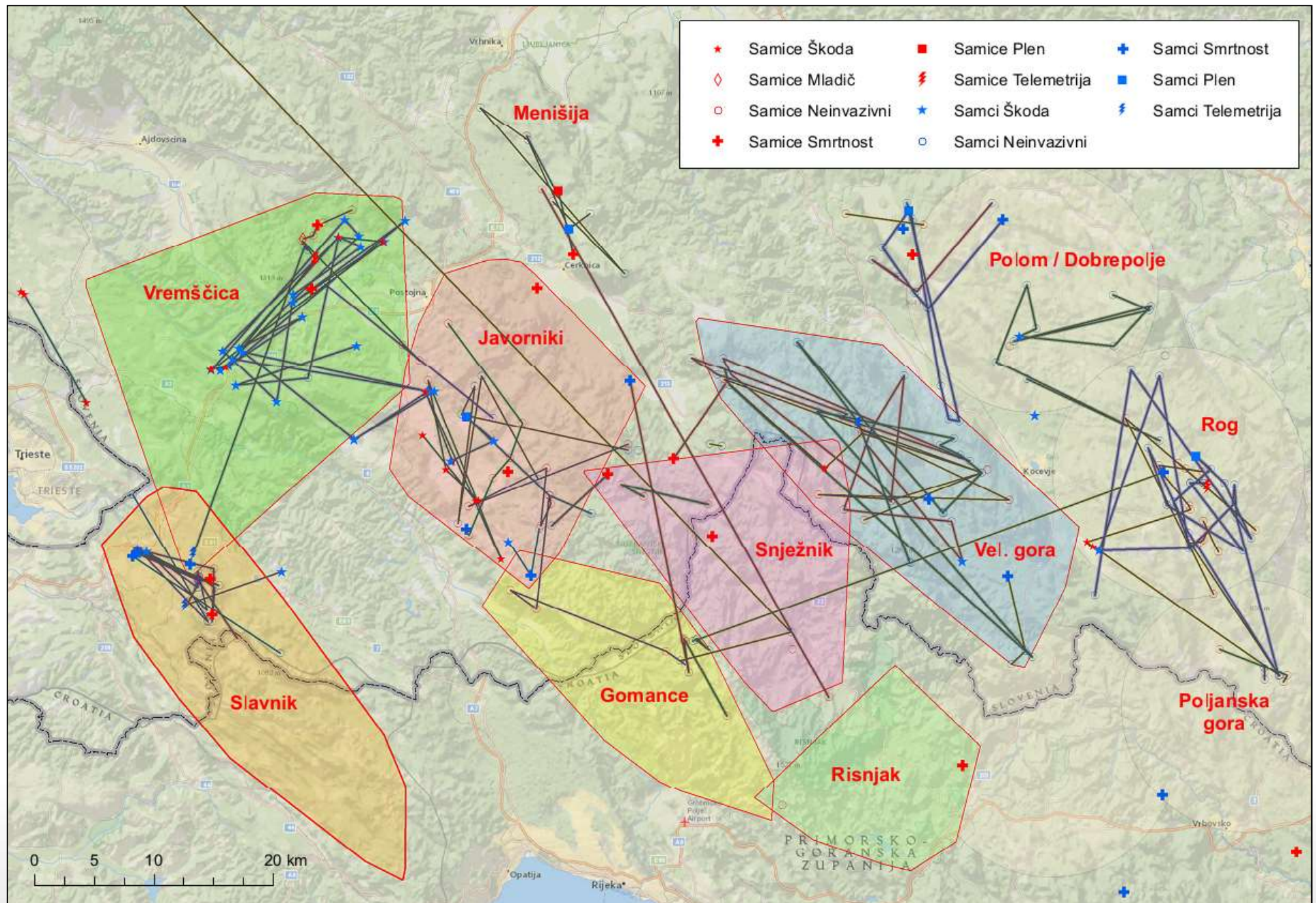
Problems

- Considerable number of **other species** (fox, domestic dogs)
- Relatively low PCR success rate (~50%)
- A lot of mixed samples.
- Wolf genotypes (correct species + good DNA) ~ 35% of samples.

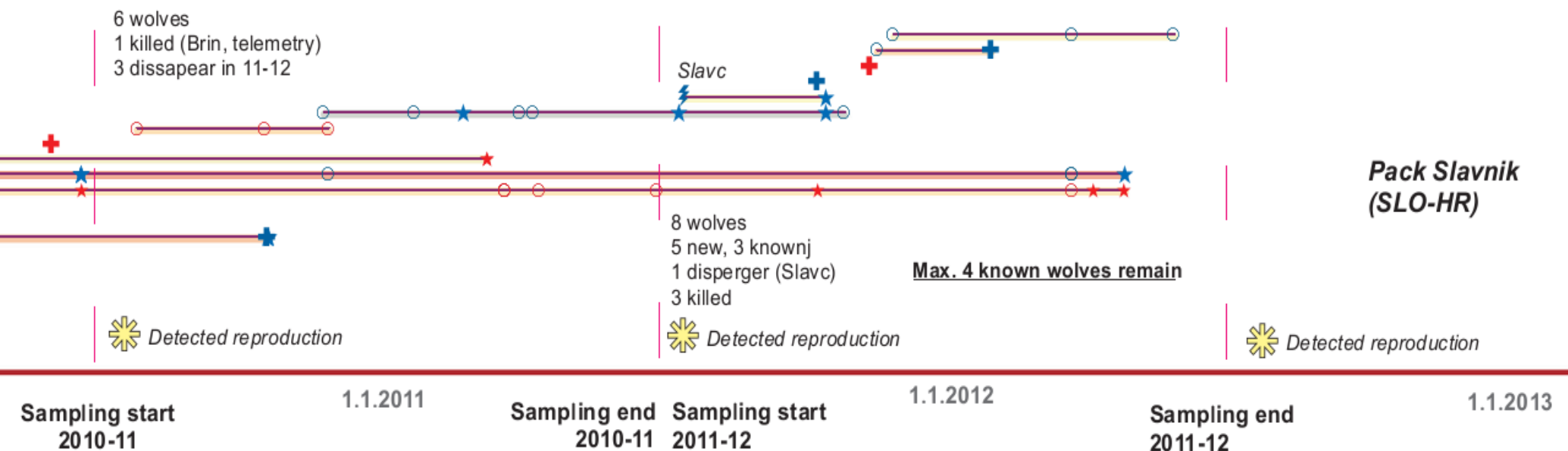
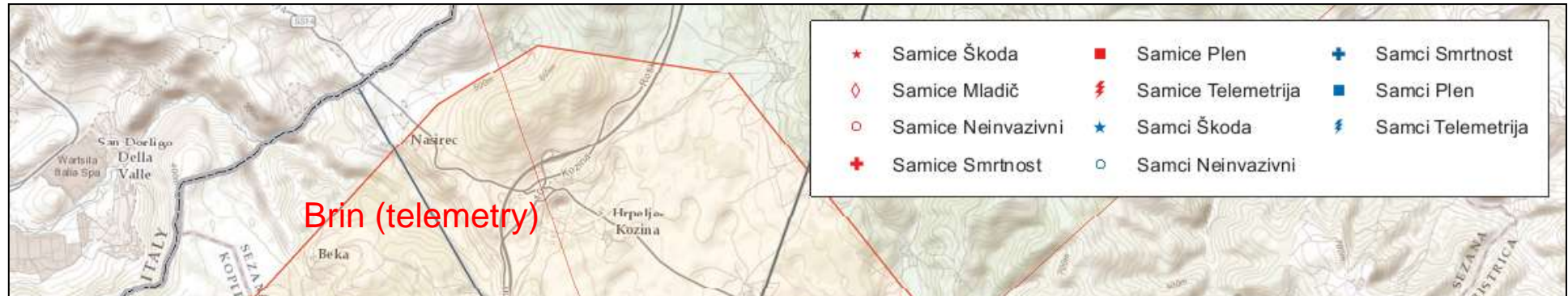
Outcome

- High **recapture rate** (3.1 – 3.5) -> reliable population size estimates.

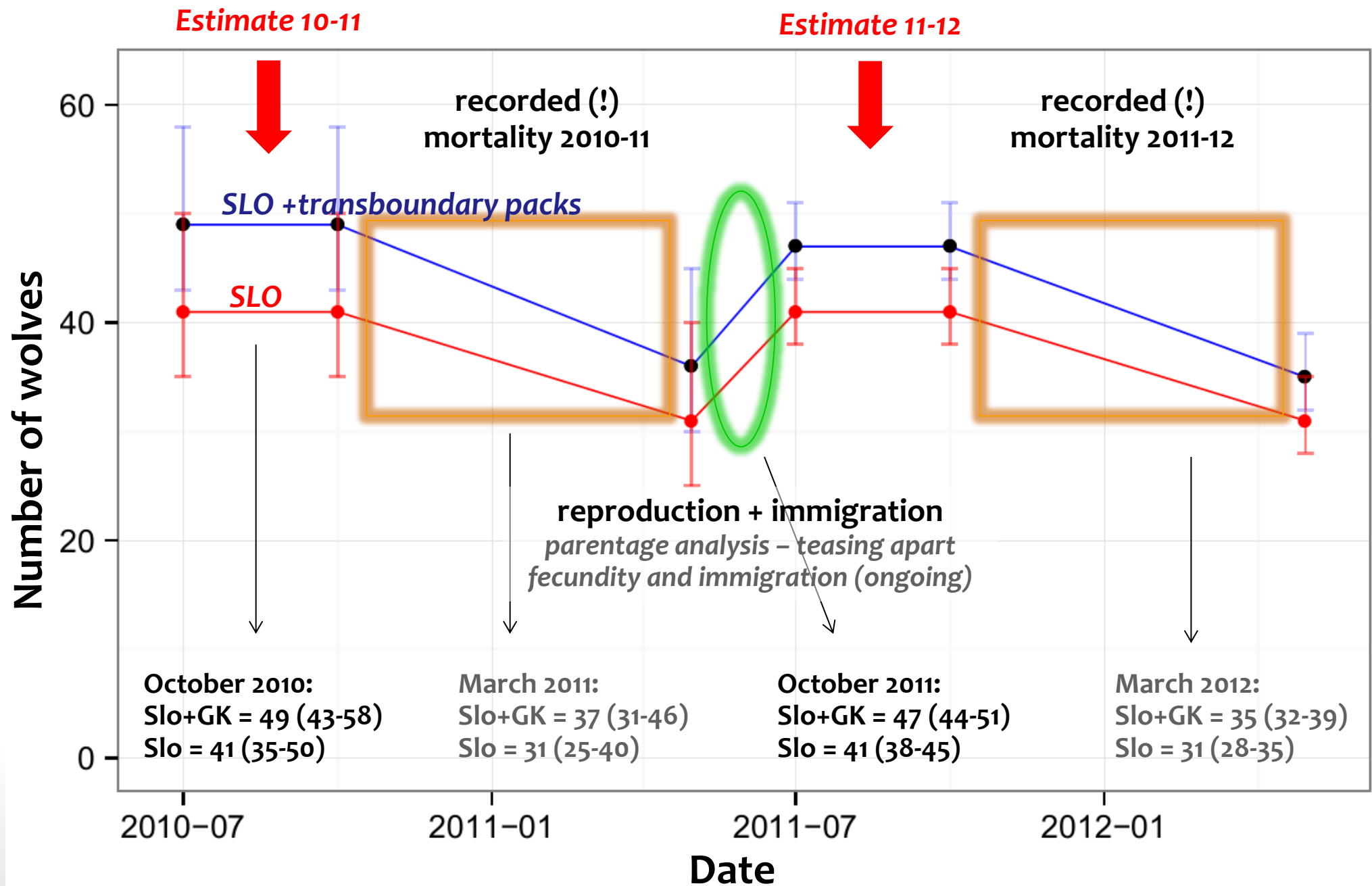
Packs and samples (w/o 2012/13 season)



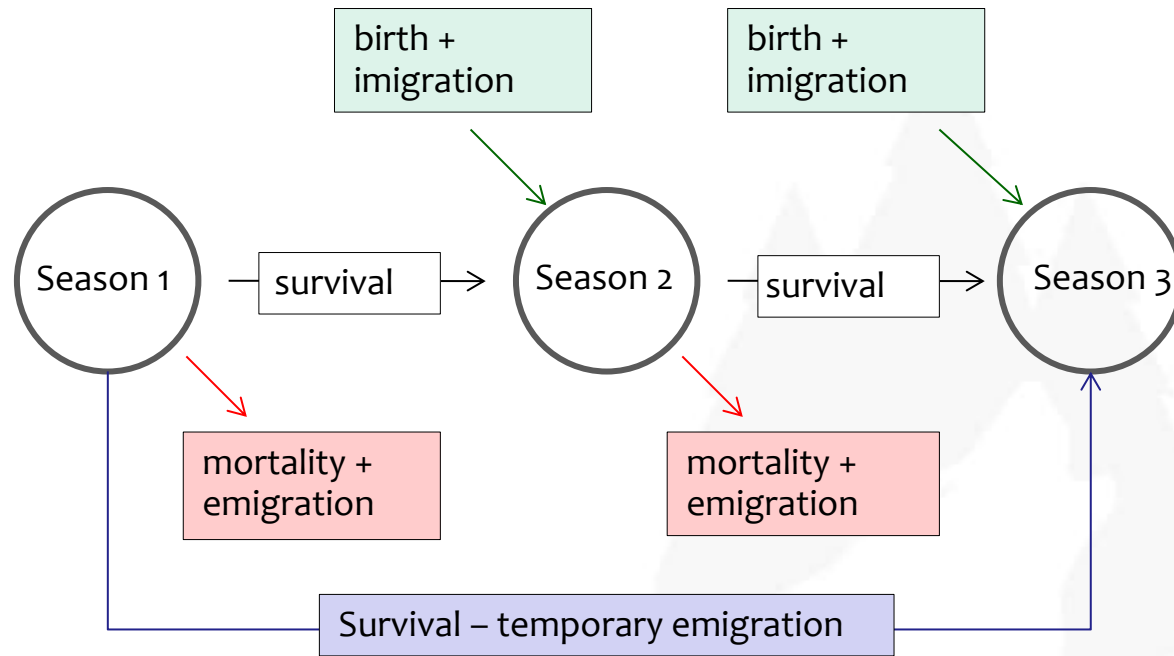
Pack-level monitoring example (pack „Slavnik“, 2010-12)



Number of wolves in Slovenia 2010 - 2012



To-do within the next couple of months...



- **Population size estimate** for Season 3, better overall estimates (all data in a single model).
- **Population dynamics** (fecundity vs. immigration, emigration + mortality).
- Estimate of **undetected mortality** (disappearance of reproductive animals).
- Population **turnover**.

Conclusions

- **Population** size has been considerably **overestimated** (by factor 2).
 - Started considerable debate over cull quotas!
- **Pack-level monitoring** provides tools for **fine-scale management** of wolves (e.g. allowing for development of pack social structure despite culling)
- **Understanding dynamics** at the population and pack level will provide new insights into biology of wolves in **populations under high cull pressure**.



Take-home messages

- **There is no single population size** in natural populations! Populations **change**, and must be **monitored** if they are to be managed!
- **Population-level coordination** is required in monitoring and management of large carnivores.
- We have a good **starting point** for continuous wolf monitoring in our landscapes.

Thank you.

