Present habitat suitability of the historical breeding area of the European roller in Hungary

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European rollers in the Carpathian basin

- The European roller (*Coracias garrulus*) is a secondary cavity nester species inhabiting typically grasslands and farmlands, which has suffered large declines both in size and range of the population since the 1960s.
- Applying direct conservation actions this negative trend has been reversed in several countries.
- In Hungary, it used to be a common species (Kiss &Tokody, 2017), Fig1), and it also decreased from the 1980s and it disappeared as a breeding species from the Western part of the country by the end of 1990s .
- Nowadays, the roller population is increasing due to the conservation programs (Kiss et al. 2014)

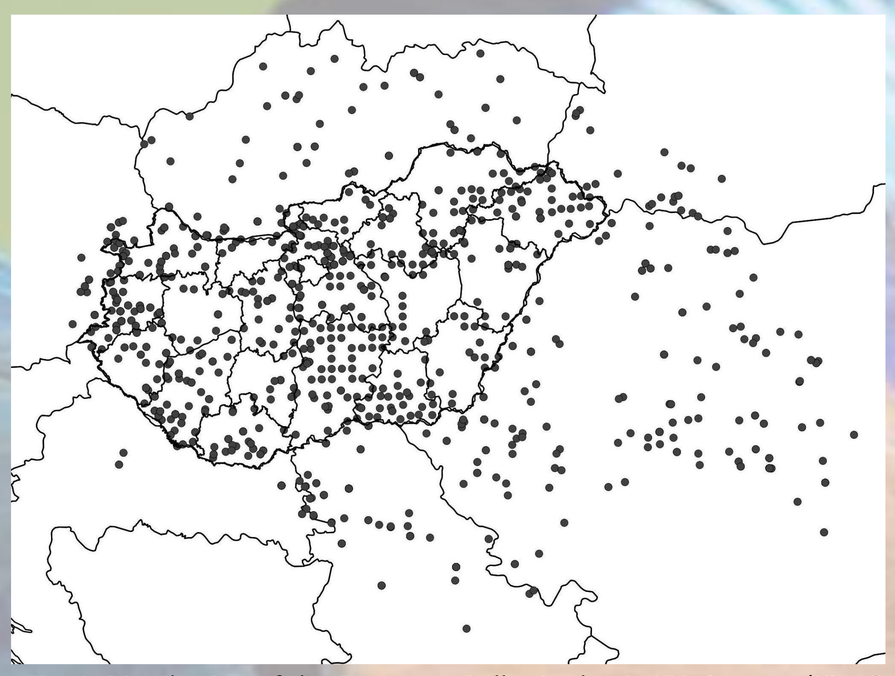

Fig. 1. Distribution of the European Roller in the in XX. Century (Kiss & Tokody 2017)

Aims

- Evaluate the current suitability of historical breeding area for a nest-box program to promote the recolonization and enlargement of the breeding range in Hungary.
- Examine the potential role of the Natura 2000 network in roller conservation in Hungary by calculating overlaps between the predicted areas and Nature 2000 sites.

Methods

- Nest-box occupancy data from 2016 (n=1449) (Fig2)
- MaxEnt for species distribution modelling (SDM)
- Environmental predictors: CORINE Land Cover 2015, Copernicus high resolution forest layers, and the Hungarian Land Parcel Identification System (MePAR) e.g. scattered trees, treelines, environmentally sensitive, and sensitive permanent grasslands.

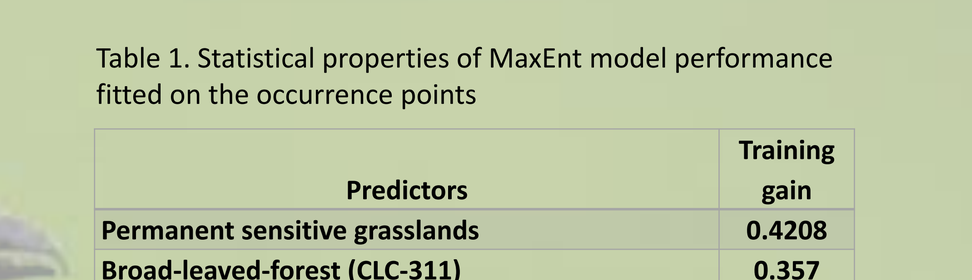

Fig 2. The locations of occupied nest-boxes used for the modelling procedure and the predicted area (2.5x2.5 km grid) for roller conservation

Table 1. Statistical properties of MaxEnt model performance fitted on the occurrence points

Predictors	Training gain
Permanent sensitive grasslands	**0.4208**
Broad-leaved-forest (CLC-311)	**0.357**
Land principally occupied by agriculture, with significant areas of natural vegetation	**0.1233**
Non irrigated arable (CLC 211)	0.0922
Tree Cover Density 2015	0.0887
Inland marshes (CLC 411)	0.0778
Black woodpecker	0.0708
Forest Type 2015	0.0641
Non sensitive permanent grasslands (2018)	0.056
Transitional woodland-scrub (CLC-324)	0.0548
Mixed forest (CLC-312)	0.0506
Fruit tree plantation (CLC-222)	0.0313
Complex cultivation patterns (CLC 242)	0.0291
Coniferous forest (CLC 312)	0.024
Green woodpecker	0.0124
Vineyards	0.011
Water bodies	0.0072
Tree lines (2018)	0.0048
Scattered trees (2018)	0.0022
AUC	0.8825

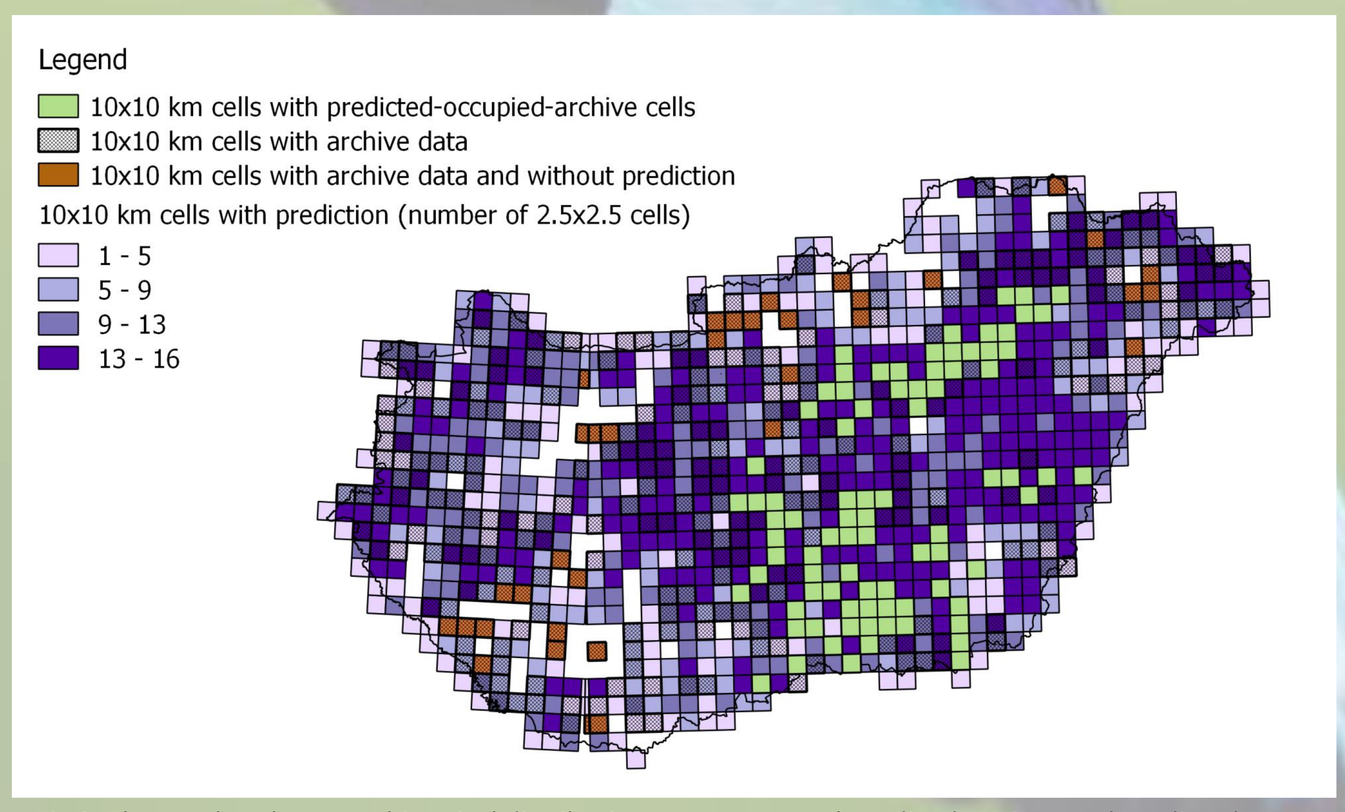

Fig 3. The overlaps between historical distribution range, current breeding locations and predicted areas.

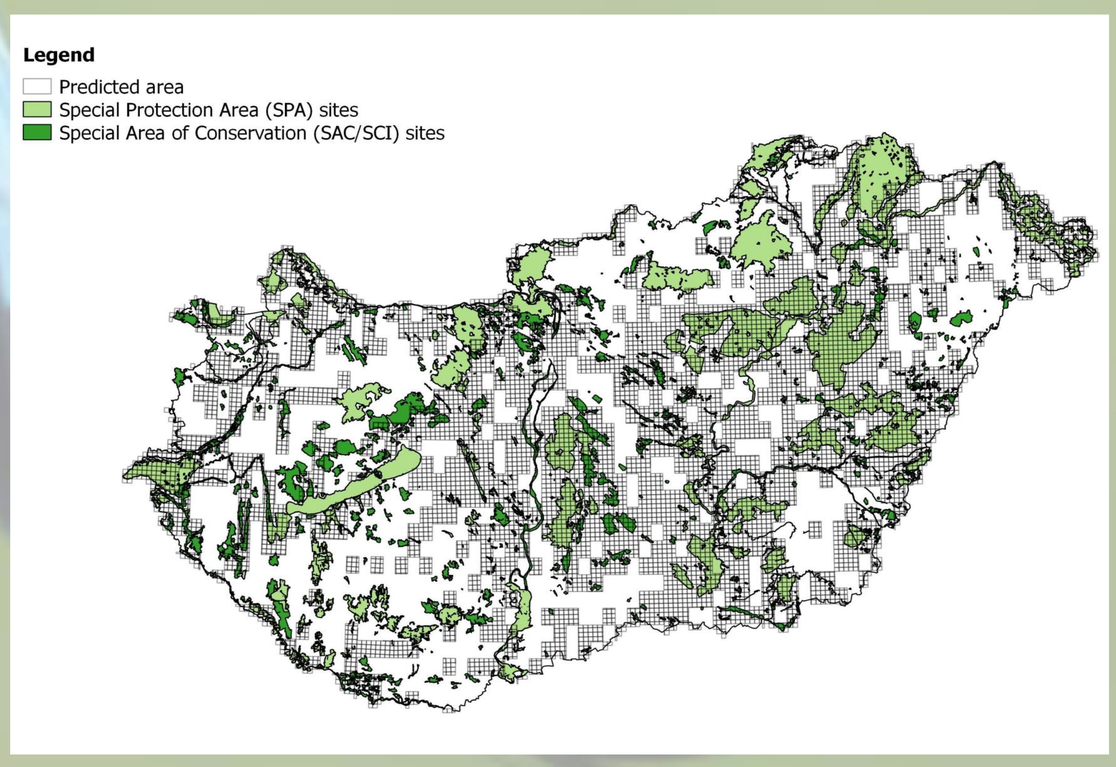

Fig. 4. Natura 2000 sites in Hungary and predicted area

Results and discussion

- Grasslands, broad-lived forests, agriculture sites with significant areas of natural vegetation were found as the most important predictors (Table 1).
- 71% of the predicted area was without current nest-box occupancy data (Fig.2.).
- Significantly larger proportion of grid cells with archive data still preserve suitable land cover composition for rollers (Fig.3.) than cells where the former breeding wasn't confirmed
- Only small proportion of former breeding area has become completely unsuitable for the species (Fig.3).

Our study highlights the significance of grasslands in preserving biodiversity of agricultural areas. Our results also suggest that coordinated network of protected areas such as Natura 2000 can potentially serve as core areas in the recolonization processes (Fig. 4.).

References

Kiss et al. 2014. High breeding performance of European Rollers Coracias garrulus in heterogeneous farmland habitat in southern Hungary. BIRD STUDY 61:496-505.

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Acknowledgements

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