Loop migration in adult European rollers (*Coracias garrulus*) through the Middle East

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Introduction

- The European roller (*Coracias garrulus*) is a long-distance migrant which population has undergone a serious decline in the past few decades .
- Besides the lack of nesting and foraging site, threats during migration and wintering might also contribute to this decline.
- Former studies found different migration pathways for central and northern population of European rollers (Finch *et al.* 2015) and suggested the use of Arabian-peninsula in spring based on ring recoveries (Finch et al. 2016).
- The aim of this study was to identify the migration route, stopover site and wintering area of the Carpathian basin within the framework of LIFE13/NAT/HU/000081 LIFE+ project

Methods

- 6 adult European rollers were deployed with 5-g solar-powered PTT-100 satellite transmitters (Microwave Telemetry Inc., Columbia, MD, USA).
- The tagged birds represented the most significant roller subpopulations in Hungary.
- All rollers were tagged during the incubation period 2015 and 2016.
- Satellite transmitters were programmed with an about 8-h ON/ 15-h OFF duty cycle
- 7 spring ringing recapture data (1931-2017) was provided by the Hungarian Bird Ringing Centre
- ArcGis 10.2 with Home Range Tool and QGIS 2.8

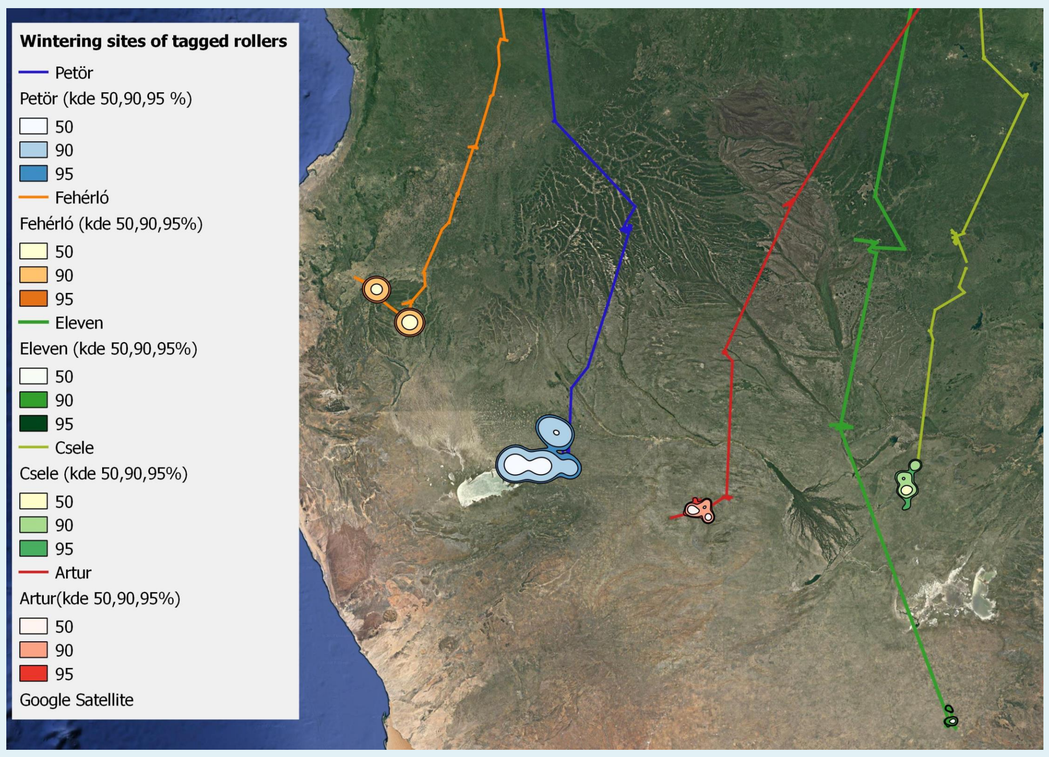

Fig. 2. Wintering sites of the tagged European rollers

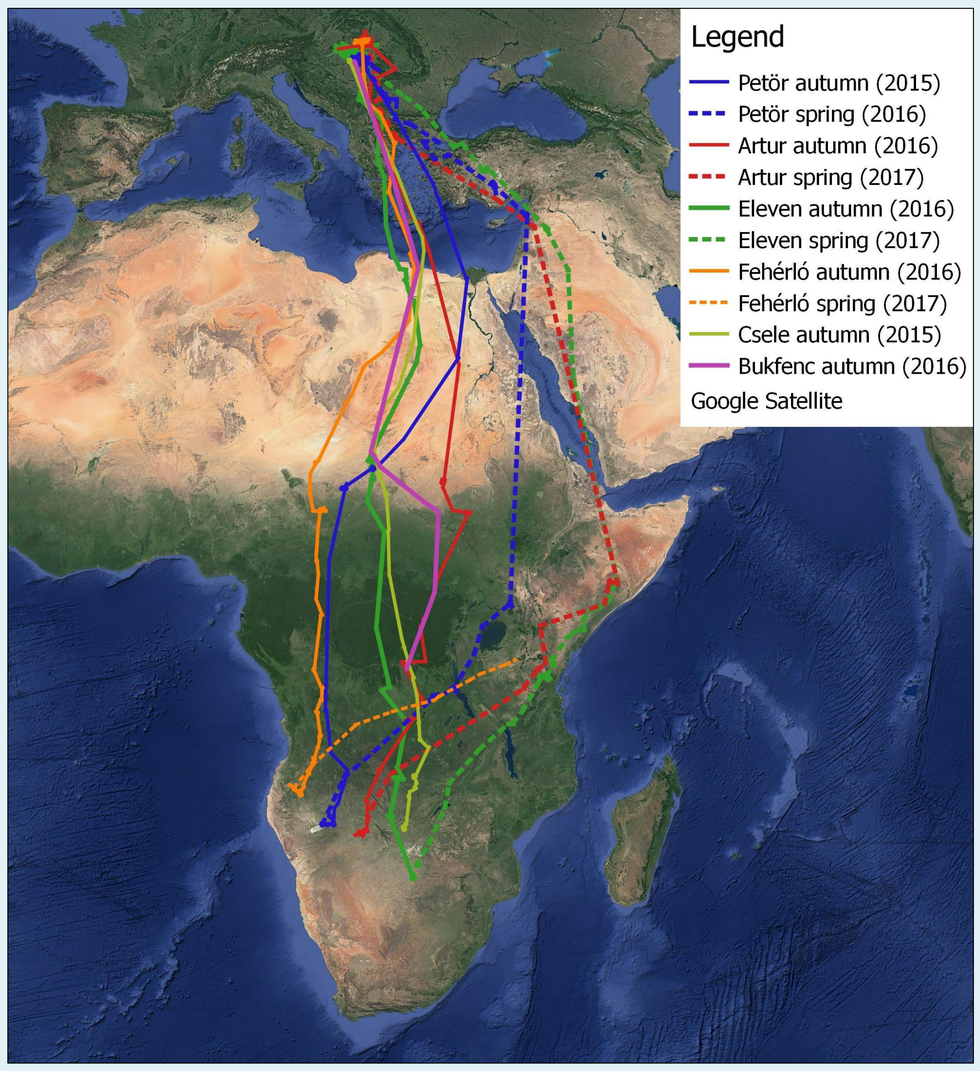

Fig. 1. Overview map of the migration of six European rollers from the Carpathian basin

Results

- 2 out of 6 tagged rollers died during the migration (after the rainforest zone and in Tanzania) and one during the wintering period.
- The spring migration pathway was longer in each bird then the autumn (9616±912 km vs 8341±765 km) and the duration was on average 18±6,5 days shorter .
- Most of the rollers migrated through the Balkan peninsula, but proceeded on a broad front across the Sahara (Fig.1.)
- Wadi Fara region is Chad was used by 4 bird as a stopover sites for 8-27 days and eastern Africa was found as an important stopover site during the spring migration
- All of the tagged birds spent the winter below the rainforest zone, but in different countries (Angola, Namibia, Botswana)
- The average area used by rollers during wintering was 5205 ± 5667km^2(95% Kernel Density Estimation (kde) (Fig.2.)
- All of the rollers which has started the spring migration used the counter-clockwise loop pathway trough the Arabian peninsula (Fig.3.)

Discussion

- However, Finch *et al.* (2015) found slightly clockwise migration in Austrian population, all of our tagged rollers follow counter-clockwise loop during spring migration
- This migration pattern was also found in the Latvian population, as well.
- We found weak migratory connectivity , and rollers from the Carpathian basin most probably share wintering areas with the south-western roller populations (Rodriguez-Ruiz *et al.,* 2014; Finch *et al.*, 2015)
- Ring recoveries suggest the existence of an other migration pathway for the Hungarian roller population, but the counter-clockwise loop seems to be the most common migration route which occurs in any subpopulation in Hungary.
- Stopover sites in Sahel belt were located in Chad and Sudan, four birds used the same region.
- The migration route was shorter but lasted longer in autumn than in spring.
- Crossing rain forest zone and wintering and eastern part of Africa can be challenging for adult rollers and highlight the importance of conservation measures in the countries of the Middle-East.

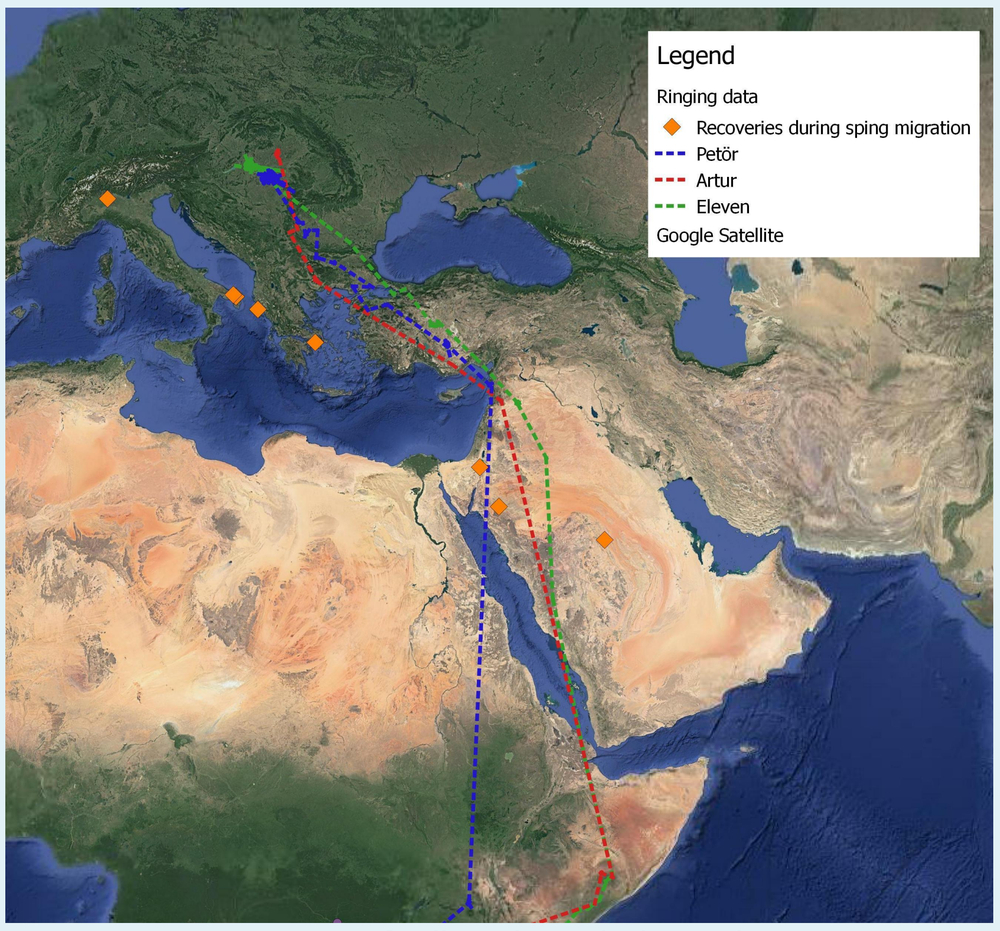

Fig. 3. Spring migration of rollers through the Arabian-peninsula

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