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Editorial

Birds on the move: Special column on bird movement

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Studying movements is essential for shedding light on a number of issues related to avian biology: behavioral aspects such as foraging, migratory routes and strategies, navigation and orientation mechanisms; ecological aspects such as metapopulation dynamics, insular biogeography, seed dispersal, disease spread; conservation biology such as the effects of habitat fragmentation, identification of key areas deserving protection, effects of climate change. Despite these relevant issues, the topic of "Movement ecology" on its own has only been highlighted recently (Nathan et al., 2008); although, the investigation of animal movements has always been one of the most fascinating topics for any zoologist and often is also quite a difficult task. Tracking avian movements can be done directly by following individuals across time and space with external markers or indirectly with biological or biogeochemical markers. A recent remarkable study discovering trans-hemispheric migration in wheatears *Oenanthe oenanthe* exemplifies the complementary use of both approaches (Bairlein et al., 2012). This column focuses on direct tracking.

The advent of new technologies that allow direct individual tracking revolutionized the study of animal movement, especially bird migration, in the last twenty years. These studies, of which this column includes nine examples, have substantially changed our perspective on how birds behave during their amazing journeys and give insights into aspects that were impossible to unravel by simple field observations. However, it must be reminded that telemetry results gain much more value if coupled with field observations in the context of experimental designs with the aim, for example, to correlate movement patterns with individual fitness and, ultimately, population dynamics (Hebblewhite and Haydon, 2010). Importantly, recent studies show that migratory birds that depend on aerodynamic performance to a greater extent, such as swallows and swifts, could be negatively affected in their flight performances when carrying tracking devices, which can be a concern from both the ethical and conservational points of view and also creates possible biases in the results and interpretations of such studies (Costantini and Møller, 2013; Scandolara et al., 2014).

This special column consists of nine papers that deal with the movement ecology of birds under a variety of perspectives (from foraging movements to long-distance migrations) using different technologies (radar tracking, satellite telemetry, GPS data-loggers, geolocators) and different species (ducks, raptors, seabirds, passerines) in different parts of the world (especially Europe, but also North America, Africa and Asia). Its primary aim is to provide an updated sample of the current research on this topic.

Hernández-Pliego et al. (2014) in paper #1 shows how departure directions of lesser kestrels foraging trips changed from a uniform distribution in the beginning of the breeding season to a concentrated distribution when food demand is higher, perhaps in response to a better experience on hunting grounds.

The work in paper #2 by Namgail et al. (2014) was also conducted on a local scale. The authors followed the movements of five species of ducks wintering in three wetlands of India and showed that a specific feeding ecology affects the amplitude of foraging movements with carnivorous ducks having the largest home ranges, herbivorous ducks the smallest, and omnivorous species having intermediate home-ranges.

Foraging movements are also the subject of paper #3 by Cecere et al. (2014) that analyzed the relationships between foraging length and factors such has habitat quality and offspring conditions in Scopoli's shearwaters, a pelagic seabird breeding in the Mediterranean. Long lasting trips were associated with lower values of primary production and higher offspring weight.

The same species has been studied, also in paper #4

by Müller et al. (2014), albeit for a different purpose: migration routes were identified through geolocators and reported a significant individual consistency and also sex differences with males departing earlier in autumn and returning earlier the following spring.

Similar topics have been investigated by López-López et al. (2014) in paper #5 that analyzed a huge dataset of migration routes of Egyptian vultures between Spain and the Sahel and found evidence of a strong endogenous control in the timing of migration and a high flexibility in routes.

Bradley et al. (2014) in paper #6 deals with a long-range migratory species, but it is located in the neotropical system. Tree swallows tagged and studied during the post-breeding migration from North America to South America, if aided by favorable winds, crossed the Gulf of Mexico with a single uninterrupted flight. In spring, however, favorable winds were much less frequent, and swallows flew over the coast tripling the length of the journey.

With a different technique, Nilsson et al. (2014, paper #7) dealt with the effects of coast morphology on the migration of small passerines during the night while crossing a small stretch of sea in southern Sweden. By using a radar, they showed that the orientation of the tracks did not differ in a way consistent with the coastlines at a local scale, but suggested an effect of the coastline on a larger regional scale, because migrants avoided long sea crossings and were funneled towards the peninsula.

In the same Swedish area, Malmiga et al. (2014, paper #8) also used radar observations to compare the flight performance of two diurnal birds of prey which concentrate in this windy area during their southward migration and show the differences between the common buzzard *Buteo buteo*, the species that mostly uses soaring-gliding, and the Eurasian sparrowhawk *Accipiter nisus*, that uses flapping-gliding flight during sea crossings.

Finally in paper #9, Desholm et al. (2014) developed a simple spatial model to identify avian migration hot-spots in coastal areas based on prevailing migration orientations and coastline features obtained by visual and radar observations. Model validation was achieved by combining nocturnal passerine movement data gathered from radar coverage and standardized bird ringing. The model correctly identified the ten most important Danish coastal hot-spots for spring migrants.

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References

Bairlein F, Norris DR, Nagel R, Bulte M, Voigt CC et al., 2012. Cross-hemisphere migration of a 25 g songbird. Biology Letters 8: 505–507.

Bradely DW, Clark RG, Dunn PO, Laughlin AJ, Taylor CM et al., 2014. Trans-Gulf of Mexico loop migration of tree swallows revealed by solar geolocation. Current Zoology 60: 653–659.

Cecere JG, Gaibani G, Imperio S, 2014. Effects of environmental variability and offspring growth on the movement ecology of breeding scopoli's shearwater *Calonectrisdiomedea*. Current Zoology 60: 622–630.

Costantini D, Møller AP, 2013. A meta-analysis of the effects of geolocator application on birds. Current Zoology 59: 697–706.

Desholm M, Gill R, Bøvith T, Fox AD, 2014. Combining spatial modelling and radar to identify and protect avian migratory hot-spots. Current Zoology 60: 680–691.

Hebblewhite M, Haydon DT, 2010. Distinguishing technology from biology: A critical review of the use of GPS telemetry data in ecology. Phil. Trans. R. Soc. B 365: 2303–2312.

Hernández-Pliego J, Carlos Rodríguez C, Bustamante J, 2014. Gone with the wind: Seasonal trends in foraging movement directions for a central-place forager. Current Zoology 60: 604–615.

López-López P, García-Ripollés C, Urios V, 2014. Individual repeatability in timing and spatial flexibility of migration routes of trans-Saharan migratory raptors. Current Zoology 60: 642–652.

Malmiga G, Nilsson C, Bäckman J, Alerstam T, 2014. Interspecific comparison of the flight performance between sparrowhawks and common buzzards migrating at the Falsterbo peninsula: A radar study. Current Zoology 60: 670–679.

Müller MS, Massa B, Richard A, Phillips RA, Dell'Omo G, 2014. Individual consistency and sex differences in migration strategies of Scopoli's shearwaters *Calonectrisdiomedea* despite year differences. Current Zoology 60: 631–641.

Namgail T, Takekawa JY, Balachandran S, Sathiyaselvam P, Mundkur T et al., 2014. Space use of wintering waterbirds in India: Influence of trophic ecology on home-range size. Current Zoology 60: 616–621.

Nilsson C, Bäckman J, Alerstam T, 2014. Are flight paths of nocturnal songbird migrants influenced by local coastlines at a peninsula? Current Zoology 60: 660–669.

Scandolara C, Rubolini D, Ambrosini R, Caprioli M, Hahn S et al., 2014. Impact of miniaturized geolocators on barn swallow *Hirundorustica* fitness traits. Journal of Avian Biology DOI: 10.1111/jav.00412.