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Data from: Early arrival at breeding grounds: causes, costs and a trade-off with overwintering latitude

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> Rotics S, Kaatz M, Turjeman S, Zurell D, Wikelski M, Sapir N, Eggers U, Fiedler W, Jeltsch F, Nathan R (2018) Early arrival at breeding grounds: causes, costs and a trade-off with overwintering latitude. Journal of Animal Ecology. doi:10.1111/1365-2656.12898

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Package Identifier	doi:10.5441/001/1.v8d24552
Abstract	(1) Early arrival at breeding grounds is of prime importance for migrating birds as it is known to enhance breeding success. Adults, males and higher quality individuals typically arrive earlier, and across years, early arrival has been linked to warmer spring temperatures. However, the mechanisms and

	potential costs of early arrival are not well understood. (2) To deepen the understanding of arrival date differences between individuals and years, we studied them in light of the preceding spring migration behaviour and atmospheric conditions en route. (3) GPS and body-acceleration (ACC) data were obtained for 35 adult white storks (Ciconia ciconia) over five years (2012-2016). ACC records were translated to energy expenditure estimates (Overall Dynamic Body Acceleration; ODBA) and to behavioural modes, and GPS fixes were coupled with environmental parameters. (4) At the inter-individual level (within years), early arrival was attributed primarily to departing earlier for migration and from more northern wintering sites (closer to breeding grounds), rather than to migration speed. In fact, early departing birds flew slower, experienced weaker thermal uplifts and expended more energy during flight, but still arrived earlier, emphasizing the cost and the significance of early departure. Individuals that wintered further south arrived later at the breeding grounds but did not produce fewer fledglings, presumably due to positive carry-over effects of advantageous wintering conditions (increased precipitation, vegetation productivity and daylight time). Therefore, early arrival increased breeding success only after controlling for wintering latitude. Males arrived slightly ahead of females. Between years, late arrival was linked to colder temperatures en route through two different mechanisms: stronger headwinds causing slower migration and lower thermal uplifts resulting in longer stopovers. (5) This study showed that distinct migratory properties underlie arrival time variation within and between years. It highlighted: (a) an overlooked cost of early arrival induced by unfavourable atmospheric conditions during migration, (b) an important fitness trade-off in storks between arrival date and wintering habitat quality, and (c) mechanistic explanations for the negative temperature-arrival date correlation in soaring birds. Such understanding of arrival time can facilitate forecasting migrating species responses to climate changes.
Keywords	animal movement, animal tracking, animal migration, avian migration, body acceleration, breeding success, Ciconia ciconia, climate change, Env-DATA, Movebank, white stork,

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