APPENDIX 1 – Supplementary material to main analyses

	Juvenile	Year	Sex	Hatching date	Date of placement in hacking station	Date of tagging	Weight when tagged	Age at release (days)	Release/ fledging date	Departure from hacking station
Translocated, hacked juveniles	94751	2009	-	03-Jun	17-Jul	01-Aug	1595	64	06-Aug	11-Sep
	94741	2009	-	03-Jun	17-Jul	01-Aug	1770	65	07-Aug	11-Sep
	94746	2009	-	10-Jun	18-Jul	01-Aug	1595	58	07-Aug	11-Sep
	94734	2009	M	08-Jun	19-Jul	01-Aug	1445	60	07-Aug	24-Aug
	94759	2009	F	10-Jun	20-Jul	01-Aug	1645	59	07-Aug	10-Sep
	94735	2009	M	14-Jun	22-Jul	04-Aug	1400	58	11-Aug	11-Sep
	94740	2009	F	12-Jun	23-Jul	04-Aug	1620	60	11-Aug	11-Sep
	94745	2009	F	13-Jun	24-Jul	04-Aug	1625	59	11-Aug	20-Aug
	94736	2009	-	14-Jun	24-Jul	04-Aug	1575	61	14-Aug	09-Sep
	94739	2009	M	16-Jun	24-Jul	04-Aug	1400	59	14-Aug	14-Sep
	94732	2009	F	08-Jun	22-Jul	04-Aug	1660	63	10-Aug	10-Sep
	94750	2009	F?	09-Jun	22-Jul	04-Aug	1600	62	10-Aug	11-Sep
Filmed at nest	Nest1	2008	-	-	-	-	-	-	03-Aug	-
	Nest2	2010	-	-	-	-	-	-	06-Aug	-
	Nest3	2012	-	-	-	-	-	-	12-Aug	-
	Nest4	2013	-	-	-	-	-	-	07-Aug	-

Table S1.1: Hatching, tagging, release and departure dates of juveniles that were translocated and hacked, and fledging dates of wild juveniles that hatched in nests monitored by web-cam in Latvia in 2009. Release and fledging dates were when juveniles left their captive environment at the hacking station, or when they were no longer visible on nest camera footage.

Threshold	*Translocated juvenile*					*Native juvenile*					*Native adult*				
	Timing (DOY)			Longitude (°)		Timing (DOY)			Longitude (°)		Timing (DOY)			Longitude (°)	
	N	Mean	SD	Mean	SD	N	Mean	SD	Mean	SD		Mean	SD	Mean	SD
Departure	11	254.7	2.4	14.0	1.8	8	260.6	4.6	13.3	0.3	9	259.9	5.2	14.5	2.7
50N	11	259.4	3.0	14.3	4.6	8	266.5	4.8	23.0	7.2	9	265.8	6.8	23.1	3.6
40N	9	270.0	4.2	14.9	12.8	8	274.8	7.9	24.8	10.8	9	275.1	7.2	31.5	1.9
30N	4	280.5	5.3	23.8	18.8	7	285.1	13.9	27.0	14.7	7	280.7	9.4	33.1	0.5

Table S1.2: Summary statistics (mean and SD) for timing (DOY) and longitude at which translocated juveniles, native juveniles, and native adults departed on migration, and at which they crossed three consecutive latitudinal thresholds.

Threshold	*South-East*					*South*					*South-West*				
	Timing (DOY)			Longitude (°)		Timing (DOY)			Longitude (°)		Timing (DOY)			Longitude (°)	
	N	Mean	SD	Mean	SD	N	Mean	SD	Mean	SD		Mean	SD	Mean	SD
Departure	18	259.8	4.7	14.3	2.3	6	255.5	4.2	13.3	0.4	4	254.3	1.9	4	13.5
50N	18	265.7	5.7	23.4	4.3	6	258.8	4.8	15.5	3.0	4	260.3	1.0	4	8.9
40N	18	275.1	7.2	30.7	1.8	4	270.3	3.6	15.2	4.7	4	268.0	2.2	4	0.7
30N	15	282.3	11.5	33.3	0.5	1	279.0	-	27.4	-	2	284.5	0.7	2	-5.2

Table S1.3: Summary statistics (mean and SD) for timing (DOY) and longitude at which birds using different flyways departed on migration, and at which they crossed three consecutive latitudinal thresholds.

APPENDIX 2 – Topography and route choice

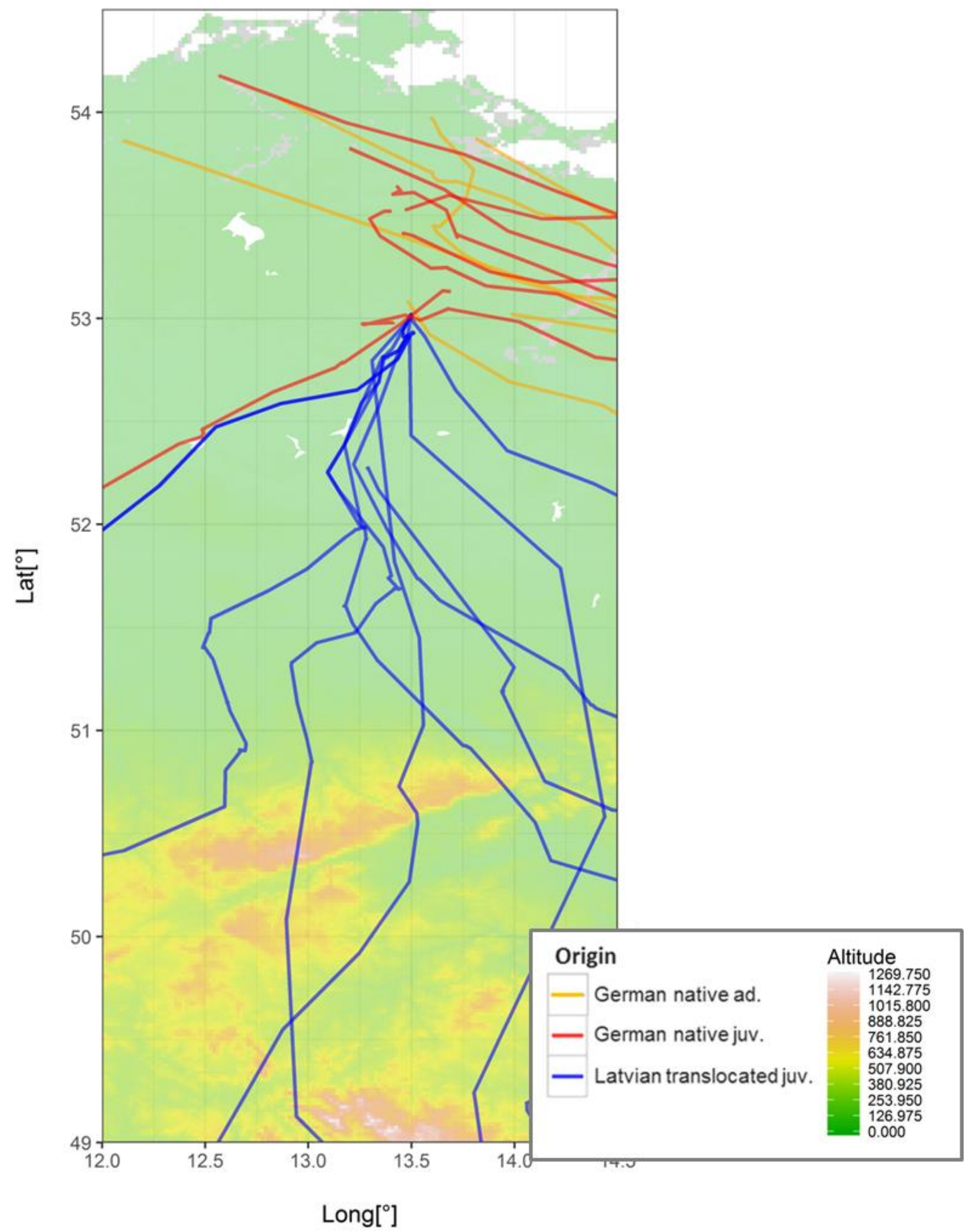

Fig S2.1: Departures of translocated and native juveniles and native adults in relation to the topography of eastern Germany. The landscape in eastern Germany is mostly flat, with topographic features ranging between -4 to 185 m above sea level. Flight paths do not appear to be influenced by these small topographic features. Consequently, we do not think that the topography in eastern Germany has a major influence on the travel directions of eagles, especially when compared to that of larger topographic features further along the migratory route such as the Alps, the Carpathians (Fig. S2.2) and mountain ranges in East Africa (Fig S2.3), and when compared to the large influence of social information on decision-making at departure.

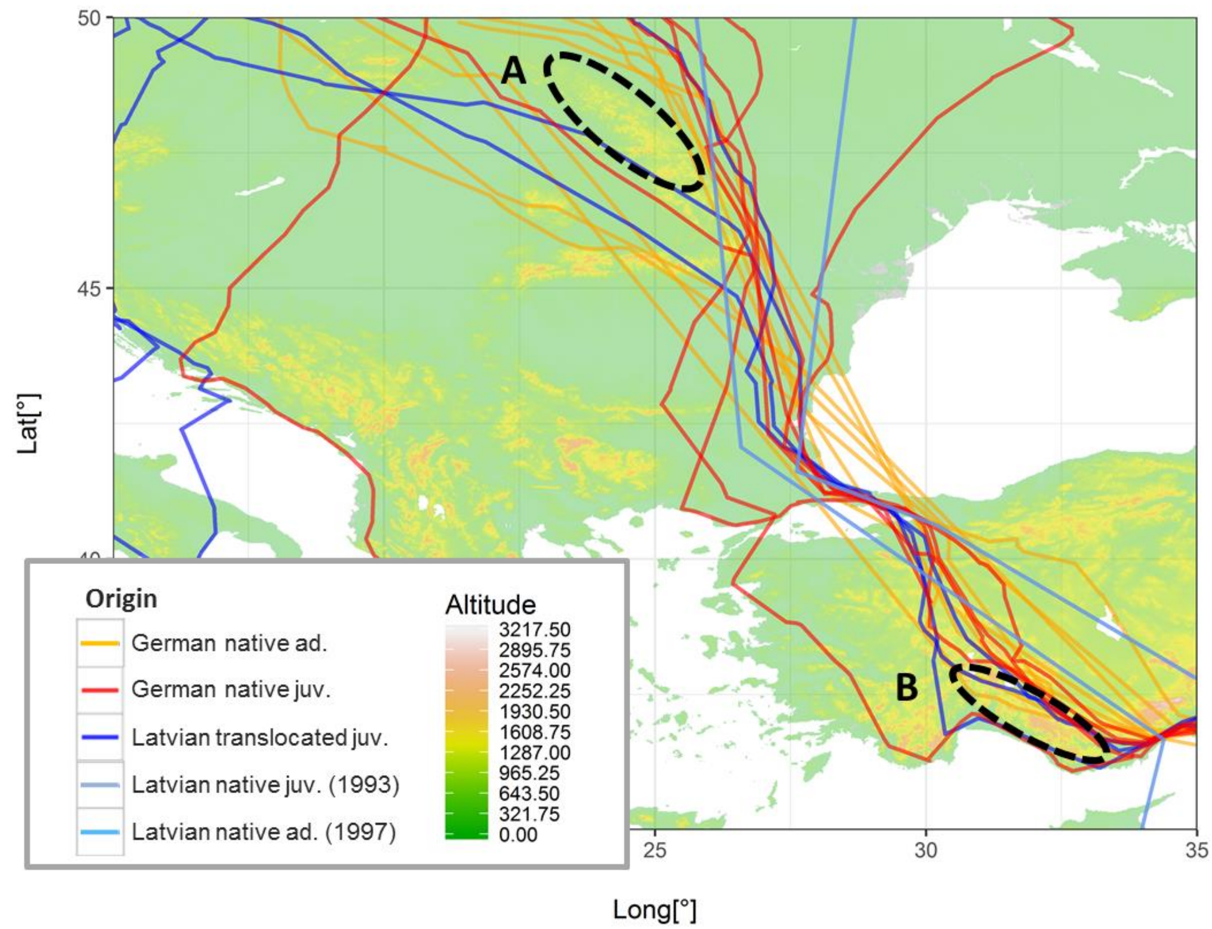

Fig S2.2: Tracks of LSEs in relation to the topography of eastern Europe and western Turkey. All eagles, whether juveniles or adults, traveling southeastward toward the Bosphorus tended to circumvent most of the Carpathian Mountains (A) and the highest peaks of the Taurus Mountains in southern Turkey (B). Note that the native juveniles from Latvia and German adults appear to have made long sea-crossings over the Black Sea and the Sea of Marmara when flying into Turkey. However, these birds were tracked at a lower resolution, and it is most likely that they also followed overland routes, like those used by German native juveniles and the Latvian translocated juveniles that were tracked at higher resolution.

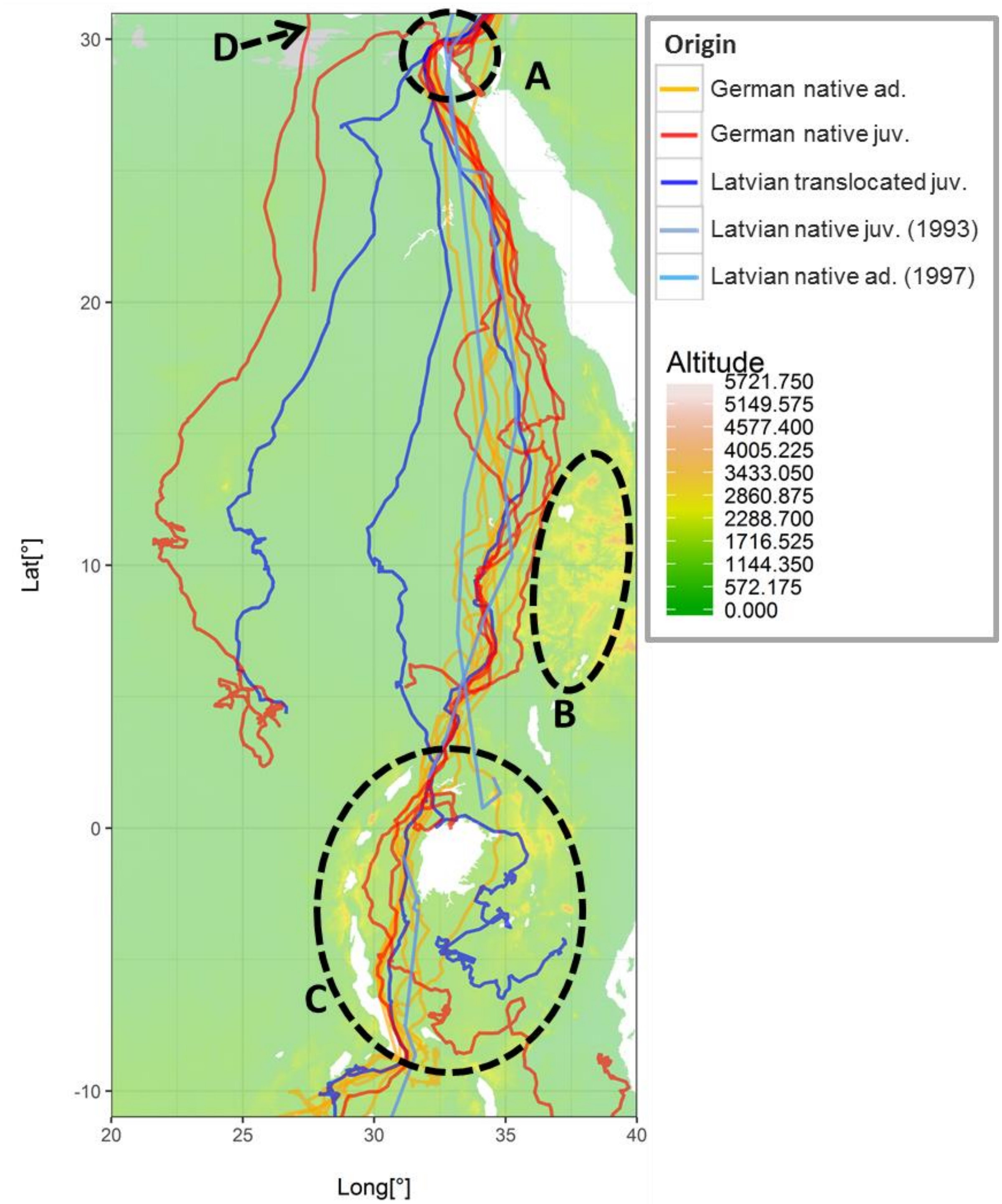

Fig S2.3: Tracks of LSEs in relation to the topography of eastern Africa. The majority of eagles entered Africa via Suez (A). They then continued south-southeastward, converging west of the Ethiopian Highlands at 10°N (B), then later diverging along the western and eastern branches of the Great Rift Valley, south of the equator (C). One native juvenile from Germany entered northern Africa further west, after crossing the Mediterranean from southern Greece (D). This bird stayed further east, and stopped migrating far to the north of most other eagles.

APPENDIX 3 – Side wind influence at departure

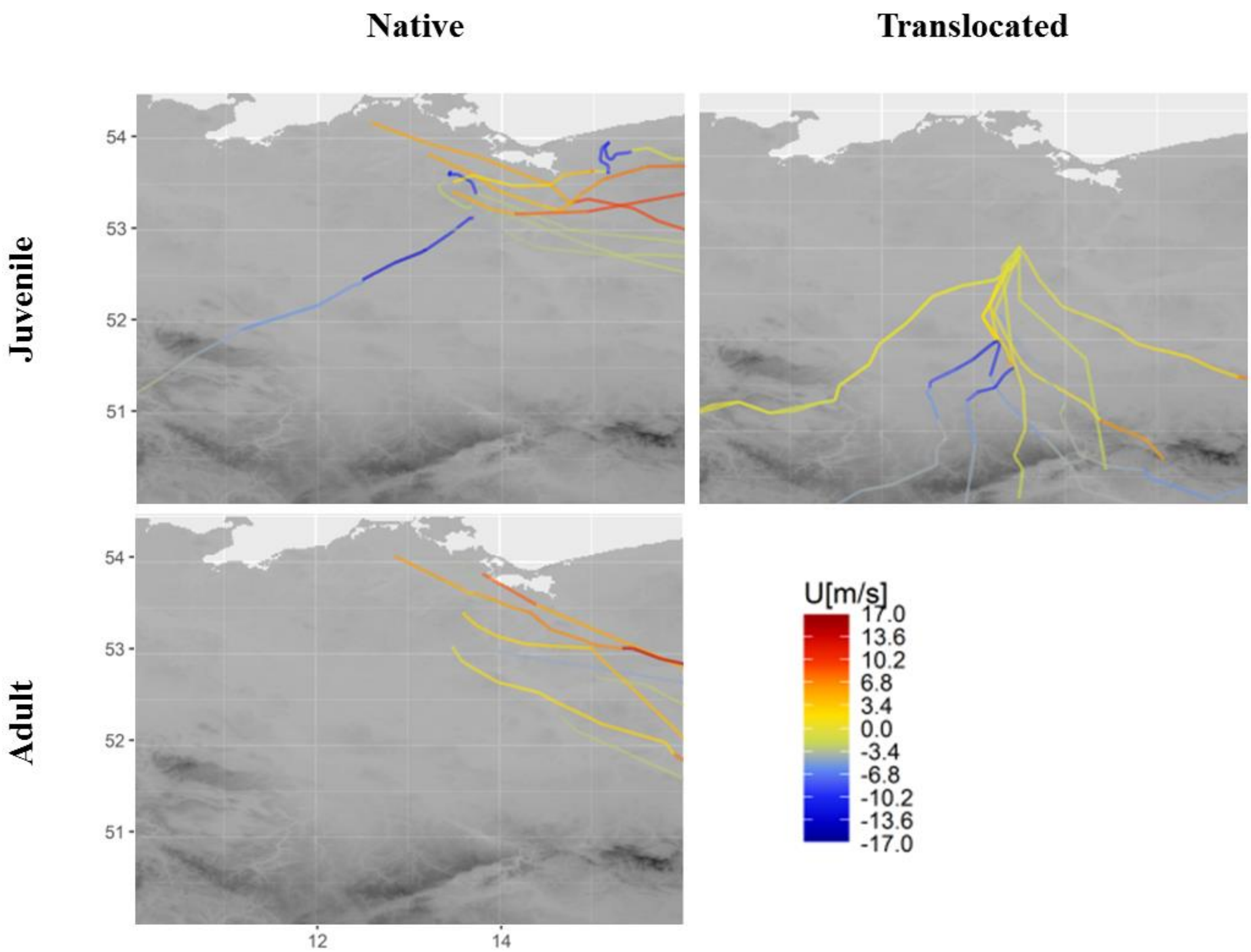

Fig S3.1: Departure routes of LSEs north of 50°N latitude, with segments colored according to the strength of westward(-)/eastward(+) winds at each preceding GPS-fix (U, see legend). Some eagles departing westward experienced strong westward winds (e.g., blue track top left), but others flew west in relatively light side winds (yellow track, top right). Most eagles departing eastward experienced eastward winds (orange and red tracks top and bottom left), though some experienced weak-moderate westward winds as well (green tracks all graphs).

Model	Intercept	$P_{intercept}$	Age	$P_{intercept}$	Origin	P_{origin}	Side wind	$P_{side\ wind}$	AIC	R^2
~Age+Origin+Side wind	22.74	2.26E-12	-0.26	0.91	-6.83	0.01	0.57	0.01	166.47	0.56
~Origin+Side wind	**22.61**	**4.81E-16**	**-**	**-**	**-6.96**	**1.56*E-03**	**0.57**	**0.01**	**164.48**	**0.56**
~Side wind	19.88	5.84E-16	-	-	-	-	0.84	0.00173	173.98	0.33
~Origin	23.06	<2E-16	-	-	-8.73	1.62E-04	-	-	174.87	0.43

Table S3.1. Generalized linear regression models explaining the longitude at which birds crossed 50°N latitude in relation to their age and origin, and the mean strength of side winds encountered north of 50°N. The most parsimonious (AIC) model explaining most variation (R^2) is indicated in bold, and includes a large effect of origin (i.e., German vs. Latvian) and an additive effect of side winds. The lack of a significant contribution of 'age' to the model is due to the confounding difference in migratory orientation between juveniles of different origin and the similarity in migratory behavior of native juveniles and native adults. According to single effect models, the origin of the birds better explains the longitude at which different individuals cross latitude 50°N than the average side wind encountered north of latitude 50°N.

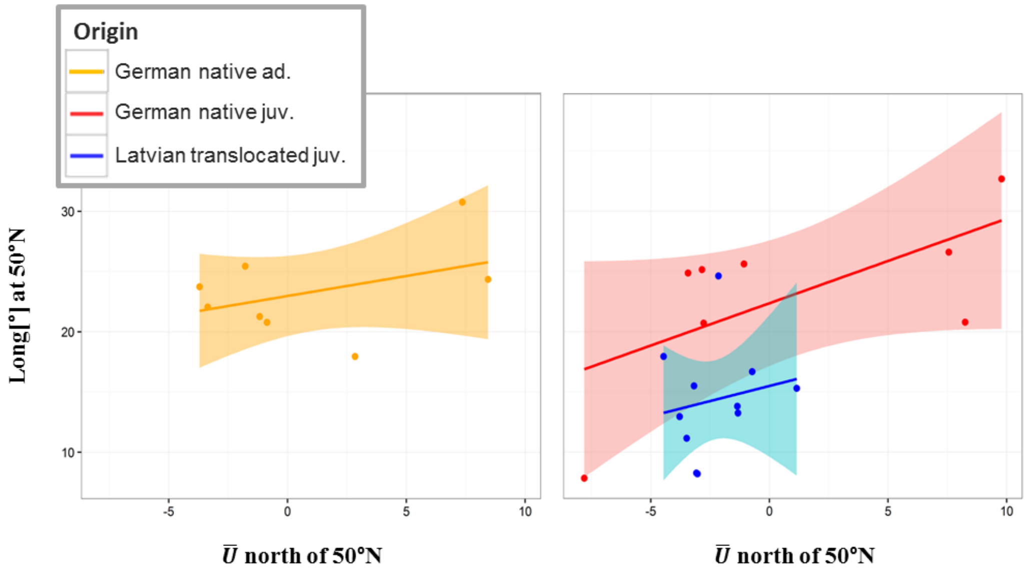

Fig S3.2. Linear regression models (90% confidence interval) for the longitude at which eagles crossed 50°N latitude, relative to the mean westward(-)/eastward(+) wind strength ($\overline{U}$) encountered north of 50°N. Models were separated according to the birds' age and origin (legend).

Group	N	Intercept	$P_{intercept}$	Side wind	$P_{side\ wind}$	AIC	R2
Native German adults	8	22.98	2.76E-06	0.33	0.31	47.59	0.17
Native German juveniles	8	22.36	4.38E-05	0.70	0.09	54.94	0.41
Translocated Latvian juveniles	11	15.49	2.14E-04	0.50	0.60	69.55	0.03

Table S3.2. Linear regression models for the longitude at which eagles crossed 50°N latitude in relation to the mean westward(-)/eastward(+) wind strength ($\overline{U}$) encountered north of latitude 50°N. The effect of side winds on longitudinal displacement at departure tended to be greater for juveniles than for adults. The effect of side winds was only significant for native juveniles, possibly because they sampled a much wider range of wind conditions at departure (Fig S3.2).

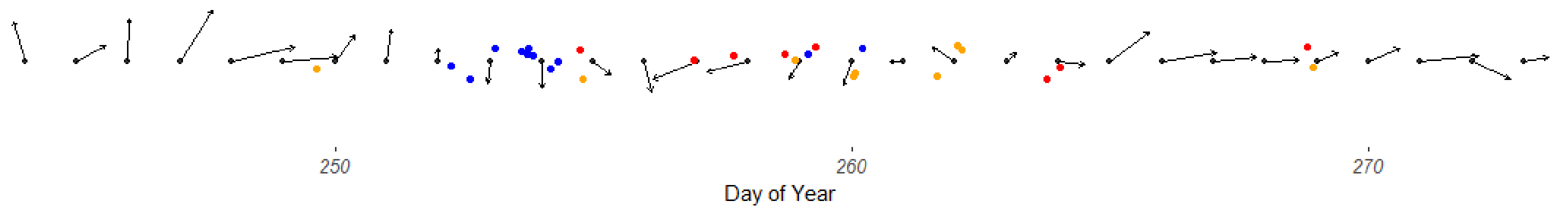

Fig S3.3. Wind conditions in eastern Germany at 12:00 UTC on each day in September 2009 and departure dates of all eagles. Vectors show daily wind speed and direction from Sept 1st – 30th 2009. On Sept 1s (DOY 244) the wind was blowing at 8 ms^{-1} towards the NNW. The highly synchronized departure of hacked Latvian juveniles (blue) around Sept 11th seems to be related to a change in wind direction, from north to south. Departures of native juveniles and adults show no obvious strong correlation to wind direction or strength, although adults did seem to depart on days with eastward or southward winds. There is much more variability in the timing of departure of German juveniles and adults than of hacked Latvian eagles due to the synchronous fledging of the Latvian eagles at the same location.