Supplementary Information

Table S1. Parameters of bat echolocation calls used for species identification. Call structure: FM: frequency modulation; CF: constant frequency; QCF: quasi-constant frequency. The size of the letter corresponds to the length of the FM and CF parts.

Species	Call structure	Frequency of maximum energy (kHz)	Minimum frequency (kHz)	Maximum frequency (kHz)	Call duration (ms)	Interpulse interval (ms)
Eptesicus nilssonii	fm-QCF	28-32	22	55	10-14	ca. 200
Eptesicus serotinus	fm-QCF	24-28	22	65	10-14	100-150
Vespertilio murinus	fm-QCF	24-27	20	50	6-20	180-200
Nyctalus noctula	alternately					
	fm-QCF	17-22	17	65	5-20	125-400
	FM-qcf	24-27				
Nyctalus leisleri	alternately					
	fm-QCF	24-25	20	55	3-14	90-350
	FM-qcf	28-30				
Pipistrellus pipistrellus	FM-qcf	42-49	35	70	3-10	60-100
Pipistrellus pygmaeus	FM-qcf	51-60	48	87	3-6	62-95
Pipistrellus nathusii	FM-qcf	35-43	35	70	5-13	110-200
Myotis spp.	FM	-*	min 20	up to 120		
Barbastella barbastellus	alternately					
	FM	30-35	23	33	2.5-4.5	45-120
	qcf-FM	39-43	33	43		
Plecotus spp.	FM	two peaks:				
		26-40	25	80	1.5-5.0	50-64
		50-60				

**Myotis spp.* contain many species with different frequencies of maximum energy. Therefore, the call structure was the main parameter used to identify this genus.

Table S2. Number of bat passes with navigation sequences on the ridge of the Karkonosze in autumn. Species/groups of species included in multivariate analyses are marked with an asterisk.

Species	No. sequences	% (95% CI)
*Eptesicus nilssonii**	781	19.2 (18.0, 20.5)
*Eptesicus serotinus**	554	13.6 (12.6, 14.7)
Vespertilio murinus	244	6.0 (5.3, 6.8)
*Nyctalus noctula**	774	19.0 (17.8, 20.3)
Nyctalus leisleri	20	0.5 (0.3, 0.8)
Pipistrellus pipistrellus	677	16.6 (15.5, 17.8)
Pipistrellus pygmaeus	86	2.1 (1.7, 2.6)
*Pipistrellus nathusii**	503	12.4 (11.4, 13.4)
Myotis sp.*	380	9.4 (8.5, 10.3)
Barbastella barbastellus	45	1.1 (0.8, 1.5)
Plecotus sp.	5	0.1 (0.05, 0.3)
Total:	4069	100

Table S3. Univariate regression models describing seasonal changes in the number of bat passes on the ridge of the Karkonosze in autumn. Table shows regression coefficients (± SE) and ΔAIC values of the linear model:

Number of passes = $\alpha + \beta$*date

versus the 2nd degree polynomial model:

Number of passes = $\alpha + \beta 1$*date + $\beta 2$*date^2

Date expressed as natural numbers (June 20 = 1, June 21 = 2 etc.) was divided by 100 to avoid extreme small values of regression coefficients.

	Linear			The 2nd degree polynomial		
Species	α	β	ΔAIC	α	β_1	β_2
E. nilssonii	3.78 ± 0.098	-2.55 ± 0.152	46.6	1.80 ± 0.3191	3.93 ± 1.002	-4.70 ± 0.732
E. serotinus	2.83 ± 0.117	-1.58 ± 0.165	100.1	-0.78 ± 0.416	9.64 ± 1.241	-7.81 ± 0.877
N. noctula	3.36 ± 0.098	-1.89 ± 0.143	112.3	0.18 ± 0.344	8.21 ± 1.047	-7.12± 0.751
P. pipistrellus	3.86 ± 0.106	-2.92 ± 0.170	73.0	0.99 ± 0.384	6.71 ± 1.253	-7.21 ± 0.959
P. nathusii	1.16 .± 0.138	0.55 ± 0.159	172.3	-4.89 ± 0.579	16.77± 1.436	-9.94 ± 0.866
Myotis sp.	1.74 ± 0.141	-2.66 ± 0.220	16.7	0.00 ± 0.449	3.06 ± 1.418	-4.16 ± 1.036

Table S4. Effect sizes of GLMMs explaining variation in the number (Poisson model with log links) and direction (binomial model with logit links) of bat passes on the ridge of the Karkonosze. Year, location of recording sites, bat species, and ID of individual observation were entered as random factors. The table shows intercepts and beta coefficients (± SE). Betas not covering a value of zero are shown in bold.

	Response variable	
Term	No. of all bat passes	Proportion N→S in N↔S passes
Intercept	1.171 ± 0.343	0.869 ± 0.380
Standardised date	**-0.868 ± 0.088**	**0.728 ± 0.197**
(Standardised date)^2	**-0.512 ± 0.063**	
Migratory habits (dummy; 1 = long-range)	0.172 ± 0.228	0.968 ± 0.505
Weather (PC1 value; higher values = milder)	**0.294 ± 0.068**	0.063 ± 0.138
Standardised date * Migratory habits	**0.637 ± 0.130**	**0.926 ± 0.335**
Weather * Migratory habits	0.079 ± 0.112	0.385 ± 0.262