Electronic supplementary material

Table S1. Estimates of all factor levels from models given in Table 1.

variable	estimate	se	lower	upper
(*a*) total annual distance (km)				
sex				
female	50978.3	3454.8	43971.6	57985.0
male	60807.5	2250.6	56243.0	65372.0
population				
France	49987.9	3616.8	42652.6	57323.2
Netherlands	59523.8	2364.7	54728.0	64319.5
Denmark	66713.0	5905.9	54735.3	78690.7
(*b*) mean daily distance (km)				
phase:sex				
breeding-female	113.5	18.6	76.7	150.3
autumn migration-female	320.7	18.6	283.9	357.5
winter-female	125.0	18.6	88.2	161.8
spring migration-female	246.1	18.6	209.3	282.9
breeding-male	212.4	12.0	188.7	236.1
autumn migration-male	285.8	12.0	262.2	309.5
winter-male	116.5	12.0	92.8	140.2
spring migration-male	255.8	12.0	232.1	279.5
phase:population				
breeding-France	111.1	20.0	71.6	150.7
autumn migration-France	285.6	20.0	246.0	325.1
winter-France	125.1	20.0	85.6	164.7
spring migration-France	242.1	20.0	202.6	281.7
breeding-Netherlands	202.1	12.5	177.4	226.8
autumn migration-Netherlands	304.1	12.5	279.3	328.8
winter-Netherlands	115.7	12.5	91.0	140.4
spring migration-Netherlands	255.3	12.5	230.6	280.0
breeding-Denmark	235.8	31.5	173.6	298.0
autumn migration-Denmark	272.8	31.5	210.6	335.0
winter-Denmark	126.0	31.5	63.8	188.2
spring migration-Denmark	264.1	31.5	201.9	326.3
(*c*) cumulative distance (km)				
phase:sex				
breeding-female	11511.2	1499.2	8547.8	14474.6
autumn migration-female	6954.4	1499.2	3991.0	9917.8
winter-female	23987.7	1499.2	21024.3	26951.1
spring migration-female	8580.2	1499.2	5616.8	11543.5
breeding-male	22883.6	965.5	20975.1	24792.0
autumn migration-male	7177.4	965.5	5269.0	9085.9
winter-male	22054.8	965.5	20146.3	23963.2
spring migration-male	8641.5	965.5	6733.0	10549.9
phase:population				
breeding-France	13443.8	1608.3	10264.8	16622.7
autumn migration-France	6086.7	1608.3	2907.8	9265.7
winter-France	23305.4	1608.3	20126.5	26484.4
spring migration-France	7364.4	1608.3	4185.4	10543.3
breeding-Netherlands	20936.6	1007.6	18945.0	22928.2
autumn migration-Netherlands	7366.8	1007.6	5375.2	9358.4
winter-Netherlands	22209.6	1007.6	20218.0	24201.2
spring migration-Netherlands	8877.9	1007.6	6886.3	10869.5
breeding-Denmark	25021.1	2535.1	20010.3	30031.9
autumn migration-Denmark	8004.0	2535.1	2993.2	13014.8
winter-Denmark	23720.8	2535.1	18710.0	28731.6
spring migration-Denmark	10113.4	2535.1	5102.6	15124.2

Table S2. Model output of post-hoc tests on total annual distance between populations, as well as mean daily distance and cumulative distance between annual cycle phases.

| variable	estimate	χ^2-value	*P*-value
(*a*) post-hoc test population differences total annual distance (km)			
F-NL	-9535.8	4.77	0.06
F-DK	-16725.1	5.99	0.04
NL-DK	-7189.3	1.25	0.26
(*b*) post-hoc test phase differences mean daily distance (km)			
breeding-autumn migration	-131.18	5.96	<0.001
breeding-winter	39.27	5.11	0.03
breeding-spring migration	-88.64	26.01	<0.001
autumn migration-winter	170.46	96.18	<0.001
autumn migration-spring migration	42.54	5.99	0.03
winter-spring migration	-127.92	54.16	<0.001
(*c*) post-hoc test phase differences cumulative distance (km)			
breeding-autumn migration	10418.1	57.23	<0.001
breeding-winter	-5939.2	18.60	<0.001
breeding-spring migration	8753.1	40.40	<0.001
autumn migration-winter	-16357.3	141.08	<0.001
autumn migration-spring migration	-1665.1	1.46	0.23
winter-spring migration	14692.2	113.82	<0.001
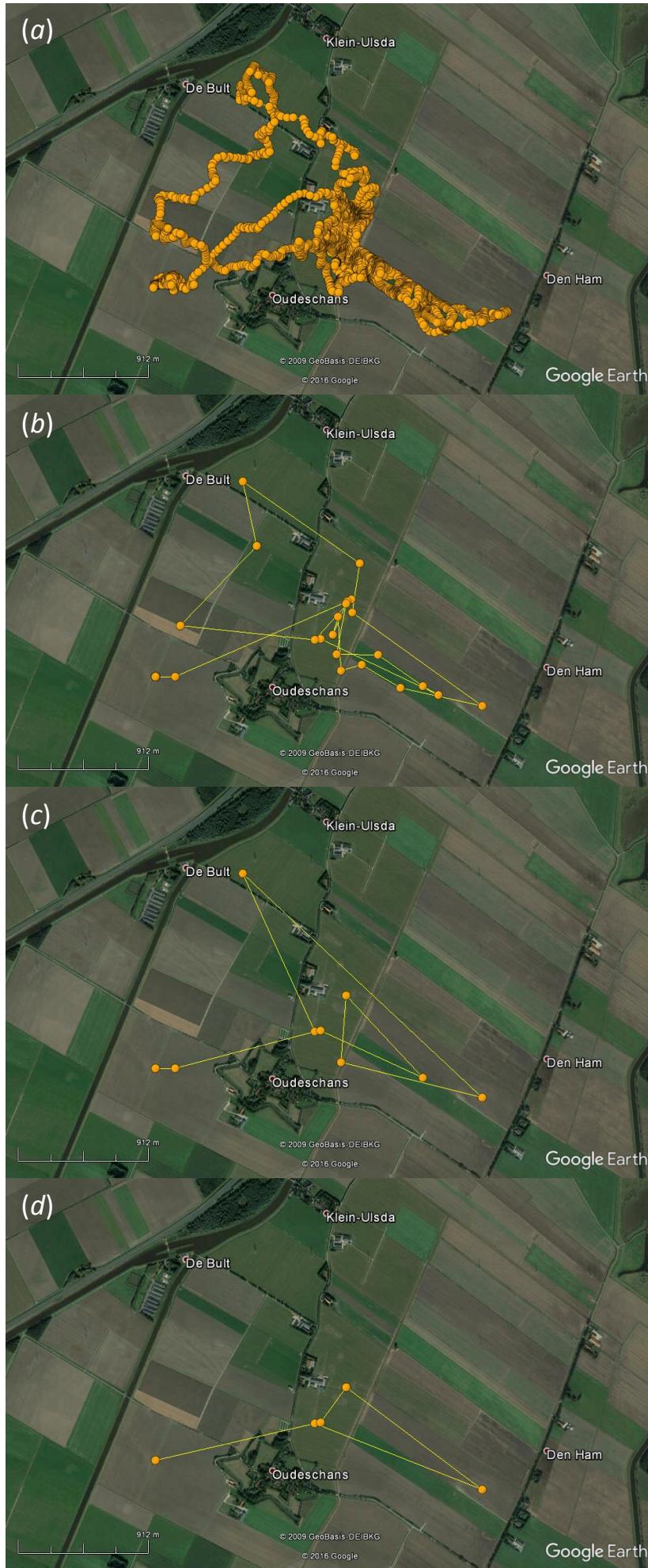
Figure S1: (*a*) Two hours of high-resolution (3 seconds interval) track of male Montagu's harrier Elzo (ID 428) on 24 May 2012 during the breeding season in the Netherlands. Same track subsampled to (*b*) 5 min, (*c*) 15 min, and (*d*) 30 min interval. Distances calculated between consecutive positions: (*a*) 30.4 km, (*b*) 10.4 km, (*c*) 7.7 km, (*d*) 3.9 km.
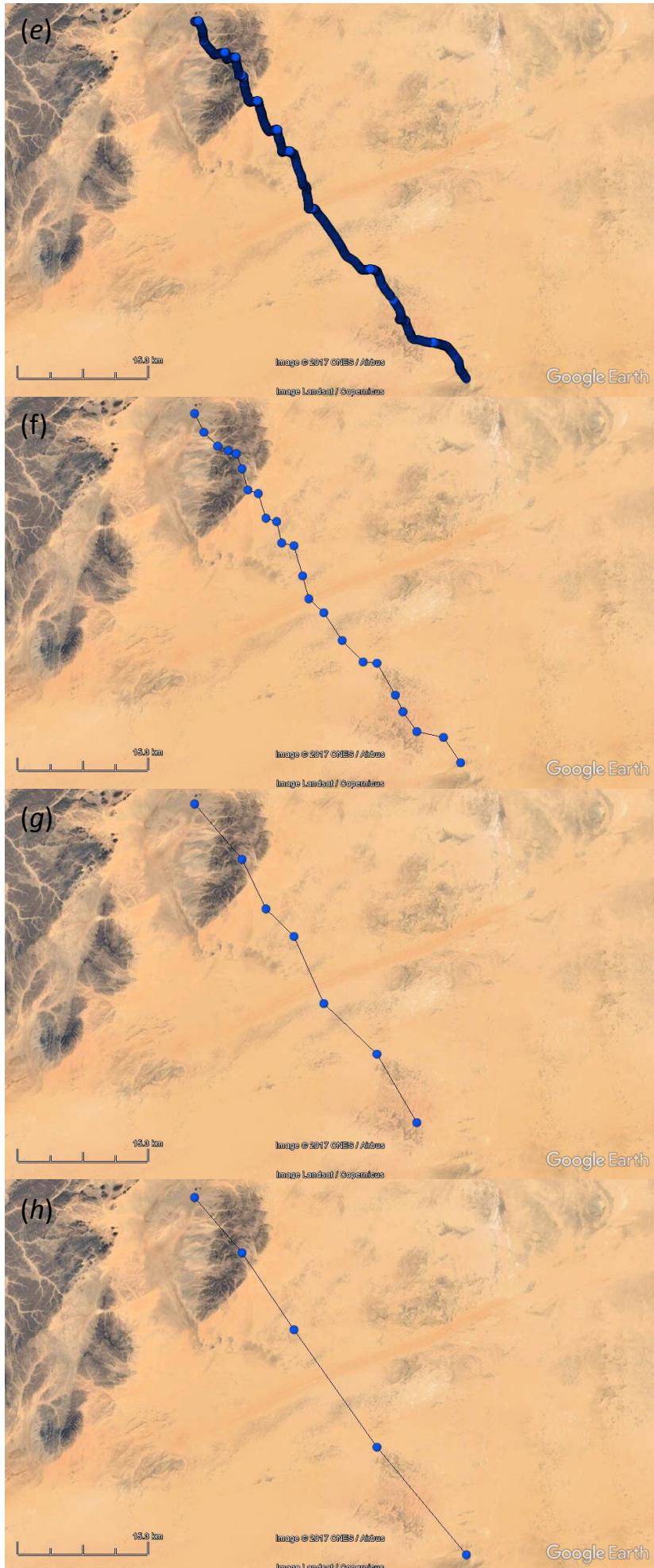
Figure S1 continued: (*e*) Two hours of high-resolution (3 seconds interval) track of male Montagu's harrier Elzo (ID 428) on 19 September 2011 during autumn migration crossing the Sahara desert. Same track subsampled to (*f*) 5 min, (*g*) 15 min, and (*h*) 30 min interval. Distances calculated between consecutive positions: (*e*) 65 km, (*f*) 56 km, (*g*) 46 km, (*h*) 53 km.
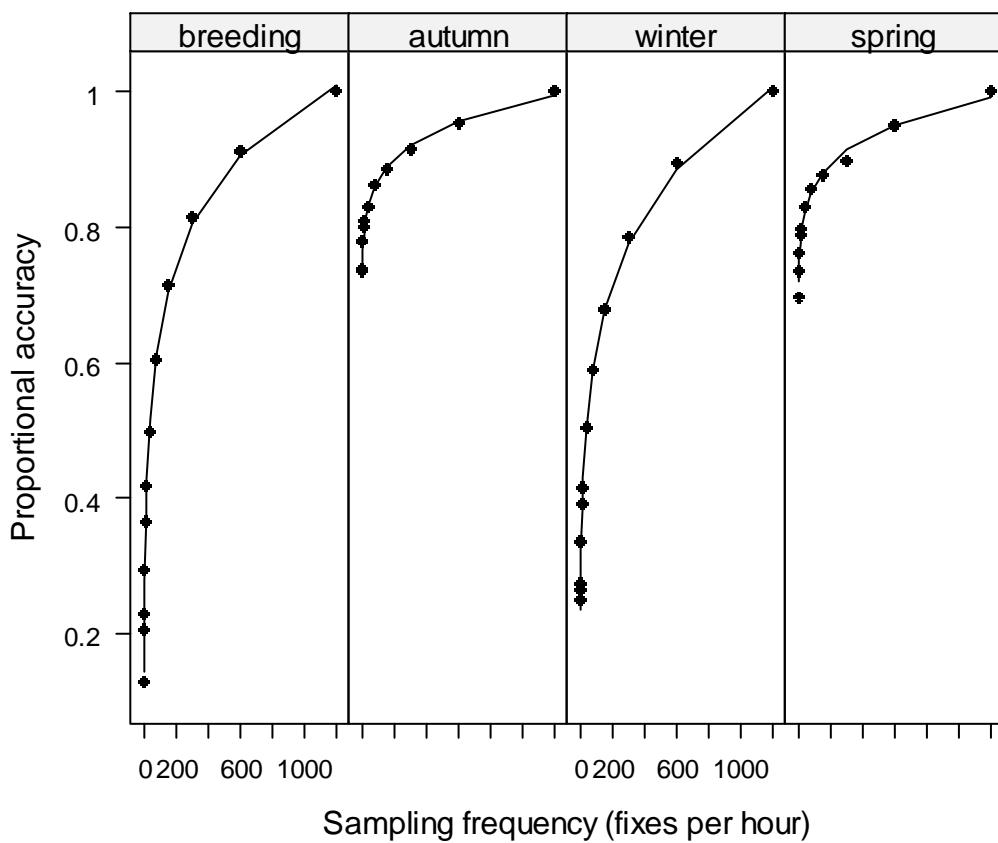
Figure S2: Proportional accuracy (ratio of apparent to true distance travelled) in relation to sampling frequency for GPS-tracked Montagu's harriers. The nonlinear least-squares estimates of the parameters were estimated fitting a non-linear model ($y = ax^b + c$) using R-function *nls* (breeding: $y = 330.57x^{0.036} - 324.41$; autumn migration: $y = 27.38x^{0.1} + 43.9$; winter: $y = 47.16x^{0.142} - 28.41$; spring migration: $y = 22.68x^{0.117} + 47.35$).
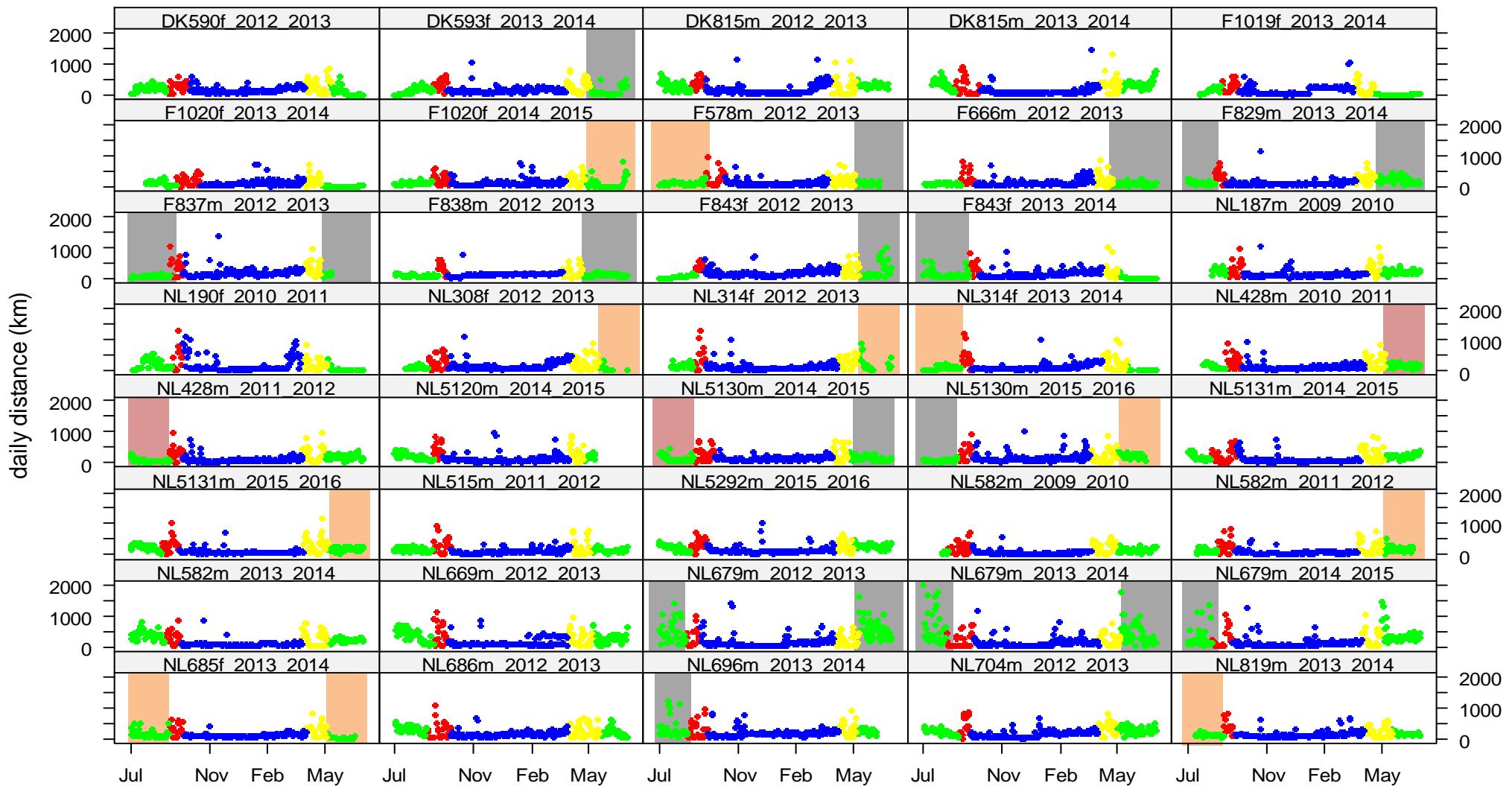
Figure S3: Daily distance travelled by Montagu's Harriers tracked by GPS-trackers during a whole annual cycle. Names of individuals are composed of country acronym (DK = Denmark, F = France, NL = Netherlands), the GPS-tracker ID, sex of the bird (f = female, m = male), and the years considered (data from 1 July in year 1 to 30 June in year 2). Colours indicate annual cycle phases (green = breeding, red = autumn migration, blue = winter, yellow = spring migration). Background colours indicate breeding fate (gray = non-breeder, orange = nest failure during egg phase, red = nest failure during chick phase). Distances were corrected according to sampling interval and annual cycle phase.