

Table S1. Data from releases at the test sites prior to the present study

Site	Date	Fam?	$N(N_b)$	α	Δh	r	Van. int.	Return	Speed	
C , Lich 192°, 40.6 km	26.04.1977	ufs	23 (20)	204°	+12°	0.88***	4:45	96%	22.7	
	26.03.1981	ufs	16 (15)	209°	+17°	0.79***	7:40	100%	29.7	
	04.07.1981	fs	12 (10)	217°	+25°	0.97***	6:35	100%	34.3	
	19.08.1984	fs	20 (10)	193°	+1°	0.91***	6:01	100%	29.7	
	22.08.1984	fs	11 (8)	205°	+13°	0.93***	3:30	100%	38.6	
	13.05.1986	ufs	23 (17)	195°	+3°	0.94***	3:04	96%	39.9	
	25.07.1988	ufs	16 (12)	201°	+9°	0.88***	4:10	100%	29.7	
	18.08.1988	ufs	17 (9)	(206°)	+14°	0.48 ^{n.s.}	3:56	100%	Not rec.	
	21.08.1989	fs	15	214°	+22°	0.96***	2:00	100%	49.7	
	02.09.1989	fs	13 (12)	201°	+9°	0.64 **	4:49	100%	Not rec.	
	13.03.1990	fs	16 (13)	205°	+13°	0.81***	3:29	100%	21.5	
	31.03.1990	fs	19 (11)	207°	+15°	0.84***	4:40	100%	Not rec.	
	01.04.1990	fs	11	200°	+8°	0.80***	2:21	100%	Not rec.	
	17.04.1990	fs	16 (11)	199°	+7°	0.92***	4:00	100%	Not rec.	
	03.08.1991	ufs	8	247°	+55°	0.78***	2:26	100%	20.5	
	08.05.1994	ufs	14 (11)	215°	+22°	0.88***	2:26	93%	42.3	
	21.07.2000	fs	10	206°	+14°	0.92***	5:56	100%	65.2	
	B1 , Hungen-Utphe 204°, 38.4 km	10.10.1982	ufs	15 (10)	203°	-1°	0.91***	7:50	93%	Not rec.
		11.06.1985	fs	14 (12)	187°	-17°*	0.89***	3:14	93%	42.7
		21.08.1985	ufs	13 (10)	196°	-8°	0.93***	4:52	100%	38.3
03.07.1986		ufs	17(12)	195°	-9°**	0.97***	3:18	100%	39.1	
10.09.1987		fs	21 (12)	190°	-14°	0.68**	3:54	95%	14.9	
23.09.1987		fs	13 (11)	208°	+4°	0.93***	4:07	100%	28.8	
23.06.1988		fs	12	190°	-14°	0.81***	4:43	100%	47.0	
18.05.1989		fs	10	199°	-5°*	0.99***	2:36	100%	Not rec.	
27.10.1991		fs	11	146°	-58°**	0.72**	3:30	100%	Not rec.	
10.05.1993		ufs	11	206°	+2°	0.99***	3:20	100%	56.2	
31.07.1990		ufs	18 (12)	241°	+22°	0.78***	3:01	100%	23.9	
03.08.1990		ufs	13 (12)	271°	+52°**	0.86***	4:04	100%	34.4	
B2 , Lauterbach. 219°, 78.7 km	12.05.1998	ufs	11 (10)	189°	-30°	0.71**	4:06	73%	44.9	
	26.08.1983	ufs	10	246°	+29°**	0.94***	3:20	100%	31.7	
A1 , Nidda 217°, 39.1 km	04.07.1985	ufs	15 (12)	227°	+10°	0.81***	2:34	100%	65.2	
	06.05.1986	ufs	11 (10)	(197°)	-20°	0.45 ^{n.s.}	4:39	100%	35.0	
	24.09.1987	fs	14 (8)	(141°)	-76°	0.0 8 ^{n.s.}	6:17	100%	17.6	
	18.05.1998	ufs	10	217	0°	0.88***	4:45	100%	58.7	
A2 , Ober Lais 225°, 44.8 km	27.05.1977	ufs	21 (10)	226°	+1°	0.61*	4:58	100%	Not rec.	
	02.06.1981	ufs	15 (10)	(203°)	-22°	0.39 ^{n.s.}	5:53	100%	28.9	
	20.06.1988	ufs	17 (12)	(212°)	-13°	0.21 ^{n.s.}	8:49	100%	38.4	
A4 , Ulmbach II 241°, 61.1 km	15.06.1997	ufs	19 (17)	274°	+49°	0.47*	4:45	95%	Not rec.	
	11.06.1987	ufs	17 (12)	239°	-4°	0.40 ^{n.s.}	5:34	100%	27.6	
	14.10.1999	ufs	10	234°	-7°	0.96***	4:15	100%	31.1	

First column: positions of the release sites with respect to the anomaly: C, control site outside, B, sites at the border of the anomaly, A, sites within the anomaly; names of the release sites, home direction and distance to home. Fam?, the familiarity of the birds with the site: ufs, unfamiliar with the site; fs, familiar with the site. $N(N_b)$, number of pigeons release and, in parentheses, number of evaluable bearings; α , mean vanishing bearing; Δh , their difference to the home direction, with + indicating a difference to the right and - a difference to the left; r , length of mean vector, with asterisks indicating significance by the Rayleigh test (Batschelet, 1981). van. int., median vanishing interval in minutes:seconds; home, percentage of pigeons that returned; speed, median homing speed in km h^{-1} ; not rec., indicates that the homing speed was not recorded. Significance levels: * $P < 0.05$; ** $P < 0.01$, *** $P < 0.001$; n.s., not significant.

Table S2. Bearings 1 min after release from the present study

Site	Date	Fam?	N_{\min}	α_{\min}	Δh_{\min}	r_{\min}	$\Delta 1 \text{ min-v.}$
C , Lich 192°, 40.6 km	29.7.2002	ufs	11	(334°)	(+142°)	0.25 ^{n.s.}	-101 ^{o***}
	9.8.2002	ufs	10	273°	+81 ^{o**}	0.80 ^{***}	-34 ^{o**}
	20.8.2002	fs	10	(339°)	(+147°)	0.22 ^{n.s.}	-114 ^{o***}
	30.6.2004	ufs	10	244°	+52 ^{o**}	0.80 ^{***}	-28 ^{o*}
B1 , Hungen-Utphe 204°, 38.4 km	18.4.2002	ufs	11	(258°)	(+54°)	0.40 ^{n.s.}	-9 ^{on.s.}
	22.4.2002	ufs	10	(129°)	(-75°)	0.47 ^{n.s.}	+79 ^{o*}
	14.6.2002	ufs	10	(118°)	(-86°)	0.46 ^{n.s.}	+81 ^{o*s}
	23.8.2002	fs	12	(219°)	(+15°)	0.45 ^{n.s.}	-12 ^{o***}
	25.6.2004	ufs	13	160°	-44°	0.53 [*]	+29 ^{o*s}
B2 , Lauterbach-R. 219°, 78.7 km	7.7.2004	ufs	11	180°	-24°	0.54 [*]	+25 ^{o*s}
	25.4.2002	ufs	10	(204°)	(-15°)	0.19 ^{n.s.}	+5 ^{o*}
	21.5.2002	ufs	12	178°	-41°	0.58 [*]	+15 ^{o***}
	29.7.2002	fs	12	251°	+32°	0.52 [*]	-45 ^{o*s}
A1 , Nidda 217°, 39.1 km	2.9.2004	ufs	13	238°	+19°	0.68 ^{**}	-22 ^{on.s.}
	22.4.2002	ufs	11	(225°)	(+8°)	0.41 ^{n.s.}	-34 ^{o*}
	13.+15.5.	ufs	16	(113)	(-104°)	0.36 ^{n.s.}	+110 ^{on.s.}
	14.8.2002	ufs	10	(299°)	(+82°)	0.35 ^{n.s.}	-85 ^{o*}
	20.8.2002	fs	10	(299°)	(+82°)	0.53 ^{n.s.}	-63 ^{o*}
	30.6.2004	ufs	14	(183°)	(-34°)	0.43 ^{n.s.}	+21 ^{on.s.}
A2 , Ober Lais 225°, 44.8 km	7.7.2004	ufs	16	199°	-18°	0.69 ^{***}	+13 ^{on.s.}
	22.4.2002	ufs	10	(344°)	(+119°)	0.37 ^{n.s.}	+179 ^{o***}
	9.5.2002	ufs	10	297°	+72 ^{o**}	0.59 [*]	-159 ^{o*s}
	14.8.2002	ufs	10	308°	+83 ^{o*}	0.52 [*]	-64 ^{on.s.}
	23.8.2002	fs	9	311°	+86 ^{o**}	0.64 [*]	-69 ^{o**}
A3 , Schottenring 219°, 56.5 km	2.9.2004	ufs	14	322°	+97°	0.88 ^{***}	-49 ^{o***}
	18.4.2002	ufs	9	275°	+56 ^{o**}	0.81 ^{***}	-61 ^{on.s.}
	9.5.2002	ufs	9	(239°)	(+20°)	0.35 ^{n.s.}	-21 ^{o*s}
	26.6.2002	ufs	9	218°	-1°	0.71 ^{**}	-29 ^{on.s.}
	9.7.2002	ufs	11	214°	-5°	0.70 ^{**}	+2 ^{on.s.}
	3.9.2002	fs	13	(194°)	(-25°)	0.31 ^{n.s.}	+24 ^{o***}
	14.6.2004	ufs	12	215°	-4°	0.51 [*]	-2 ^{on.s.}
	5.7.2004	ufs	8	235°	+16°	0.93 ^{***}	-18 ^{on.s.}
A4 , Ulmbach II 241°, 61.1 km	22.8.2004	ufs	9	219°	0	0.78 ^{**}	-4 ^{on.s.}
	17.9.2004	ufs	12	227	+8°	0.52 [*]	-13 ^{o*s}
	8.5.2002	ufs	10	327°	+86 ^{o**}	0.62 [*]	-54 ^{o**}
	16.5.2002	ufs	12	(359°)	(+118°)	0.32 ^{n.s.}	+166 ^{o**}
	15.8.2002	ufs	11	(358°)	(+117°)	0.24 ^{n.s.}	+136 ^{on.s.}

First column: positions of the release sites with respect to the anomaly: C, control site outside, B, sites at the border of the anomaly, A, sites within the anomaly; names of the release sites, home direction and distance to home. Fam?, the familiarity of the birds with the site: ufs, unfamiliar with the site; fs, familiar with the site. N_{\min} , number of bearings 1 min after release; α_{\min} , mean vanishing bearings 1 min after release; Δh_{\min} , their difference to the home direction, with + indicating a difference to the right and - a difference to the left, and non-significant data given in parentheses; r_{\min} , length of mean vector, with asterisks indicating significance by the Rayleigh test (Batschelet, 1981) $\Delta 1 \text{ min-v.}$, change from 1 min after release to vanishing, with asterisks indicating a significant difference by the Watson Williams test if $r > 0.65$, otherwise by the Mardia Watson Wheeler test (Batschelt, 1981).

Table S3. Center of vectors and medians of the vector lengths 1 min after release

Release site	Position		N	Center of vectors after 1 min				Difference		
	α_{home}	d_{home} (km)		α_{min}	a_{min}	Sign.	Med r_{min}	$\Delta 1 \text{ min-v.}$	Sign.	
C	Lich-Eberstadt	192°	40.6	4	+82°	0.43	n.s.	0.53	-45°	n.s.
B1	Hungen-Utphe	204°	38.4	6	-32°	0.33	*	0.46	+32°	n.s.
B2	Lauterbach	219°	78.7	4	+2°	0.43	n.s.	0.56	-15°	n.s.
A1	Nidda	217°	39.1	6	+5°	0.24	n.s.	0.42	-9°	n.s.
A2	Ober Lais	225°	44.8	5	+90°	0.58	*	0.59	-91°	*
A3	Schottenring	219°	56.5	9	+10°	0.58	***	0.70	-15°	*
A4	Ulmbach II	241°	61.1	5	+93°	0.42	n.s.	0.32	-119°	n.s.
A5	L.-Eichelhain	222°	65.9	9	+107°	0.30	*	0.45	-160°	***
A6	Groß-Felda	212°	68.2	9	+165°	0.33	*	0.46	-173°	***

Release sites: C, control site outside the anomaly; B, site at the border of the anomaly; A, site within the anomaly; Position: α_{home} , d_{home} , direction and distance to home; N, number of samples; α_{min} , a_{min} , centers of vectors: direction with respect to home (+, clockwise and - counterclockwise deviation from the home directions) and distance from center; Sign., significant agreement between samples (Hotelling test for bivariate samples, Batschelet 1981); med. r_{min} , median vector lengths. Difference $\Delta 1 \text{ min-v.}$, angular difference between vectors 1 min after release and at vanishing with + indicating a clockwise and - a counterclockwise shift between 1 min and vanishing; Sign., significance of this difference [Mardia test for bivariate samples (Batschelet, 1981)]. Significance levels: * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; n.s., not significant.

Table S4. Bearings 1 min after releases at the test sites prior to the present study

Site	date	Fam?	N_{\min}	α_{\min}	Δh_{\min}	r_{\min}	$\Delta 1 \text{ min-van.}$	
C, Lich 192°, 40.6 km	26.04.1977	ufs	22	199°	+7°	0.67***	+5°	
	26.03.1981	ufs	16	328°	+136°	0.50*	-119°	
	04.07.1981	fs	10	(274°)	+82°	0.14 ^{n.s.}	-57°	
	19.08.1984	fs	16	181°	-11°	0.63**	+12°	
	22.08.1984	fs	10	191°	-1°	0.58*	+14°	
	13.05.1986	ufs	21	208°	+16°	0.64***	-13°	
	25.07.1988	ufs	14	(224°)	+32°	0.25 ^{n.s.}	-23°	
	18.08.1988	ufs	13	(291°)	+99°	0.47 ^{n.s.}	-85°	
	21.08.1989	fs	14	210°	+18°	0.95***	+4°	
	02.09.1989	fs	12	222°	+30°	0.48 ^{n.s.}	-21°	
	13.03.1990	fs	14	225°	+33°	0.88***	-20°	
	31.03.1990	fs	18	241°	+49°	0.63***	-34°	
	01.04.1990	fs	11	215°	+23°	0.89***	-15°	
	17.04.1990	fs	16	230°	+38°	0.70***	-31°	
	03.08.1991	ufs	8	246°	+54°	0.62*	+1°	
	08.05.1994	ufs	12	214°	+22°	0.89***	+1°	
	21.07.2000	fs	10	228°	+30°	0.38 ^{n.s.}	-22°	
	B1, Hungen-Utpe 204°, 38.4 km	10.10.1982	ufs	15	(142°)	(-62°)	0.29	+61°
		11.06.1985	fs	11	139°	-65°**	0.70***	+48°
21.08.1985		ufs	13	140°	-64°**	0.72***	+56°	
03.07.1986		ufs	13	69°	-135°**	0.62**	+126°	
10.09.1987		fs	12	144°	-60°**	0.70***	+46°	
23.09.1987		fs	13	171°	-33°	0.56*	+37°	
23.06.1988		fs	12	160°	-44°**	0.93***	+30°	
18.05.1989		fs	9	194°	-10°	0.92***	+5°	
27.10.1991		fs	11	189°	-15°	0.82***	-43°	
10.05.1993		ufs	11	177°	-27°*	0.87***	+29°	
B2, Lauterbach. 219°, 78.7 km		31.07.1990	ufs	18	249°	+30°**	0.86***	-8°
	03.08.1990	ufs	12	296°	+77°**	0.80***	-25°	
	12.05.1998	ufs	11	180°	-39°	0.56*	+9°	
A1, Nidda 217°, 39.1 km	26.08.1983	ufs	8	164°	-53°*	0.64*	+82°	
	04.07.1985	ufs	14	222°	+5°	0.89***	+5°	
	06.05.1986	ufs	10	133°	-84°**	0.59*	+64°	
	24.09.1987	fs	12	75°	-142°	0.50*	+66°	
A2, Ober Lais 225°, 44.8 km	18.05.1998	ufs	9	238°	+21°*	0.94***	-21°	
	27.05.1977	ufs	20	244°	+19°	0.72***	-18°	
	02.06.1981	ufs	12	(126°)	(-99°)	0.29 ^{n.s.}	+77°	
	20.06.1988	ufs	16	341°	+116°**	0.62**	-129°	
A4, Ulmbach II 241°, 61.1 km	15.06.1997	ufs	17	1°	+136°**	0.57**	-87°	
	11.06.1987	ufs	14	252°	-11°	0.16 ^{n.s.}	-13°	
	14.10.1999	ufs	9	202°	-39°	0.69**	+32°	

First column: positions of the release sites with respect to the anomaly: C, control site outside, B, sites at the border of the anomaly, A, sites within the anomaly; names of the release sites, home direction and distance to home. Fam?, indicates the familiarity of the birds with the site: ufs, unfamiliar with the site and the anomaly; ufs, unfamiliar with the site, but familiar with other sites within the anomaly; fs, familiar with the site. N_{\min} , number of bearings 1 min after release; α_{\min} , mean vanishing bearings 1 min after release; Δh_{\min} , their difference to the home direction, with + indicating a difference to the right and - a difference to the left, and non-significant data given in parentheses; r_{\min} , length of mean vector, with asterisks indicating significance by the Rayleigh test (Batschelet, 1981); $\Delta 1 \text{ min-v.}$, change from 1 min after release to vanishing.

Table S5. Coefficients of the Spearman rank correlation for vector lengths 1 min after release ($N=9$)

Variable	Data set	Difference between home and release site	Range within 1 km radius	Range within 2.5 km radius	1 km in home direction
Vector lengths 1 min after release:	All releases	-0.113	+0.096	-0.029	+0.254
	Birds unfamiliar with the site	-0.321	-0.054	-0.213	-0.004
	Birds familiar with the site	+0.600*	-0.067	-0.167	+0.383

* $P=0.05$.