

Hahn, S., Bauer, S. and Liechti, F. 2009. The natural link between Europe and Africa – 2.1 billion birds on migration. – *Oikos* 118: 624-626.

## Appendix 1

Table A1. Breeding parameters, breeding population size and the resulting number of individuals of European passerine and near-passerine species migrating to sub-Saharan Africa in autumn. The columns are: order – systematic order (1: passerine, 2: non-passerine); CS – average clutch size (no. of eggs per nest), no. broods – number of broods per season, BS – breeding success, no. offspring – number of offspring per pair and season. BP\_min/max are breeding pairs in Europe according to BirdLife International (2004), and no. migrants\_min/max are the resulting numbers of individuals on autumn migration. Breeding parameters are averages calculated from Glutz von Blotzheim and Bauer (1987) and Cramp (1998), if not stated otherwise (see: superscripts).

No.	Scientific name	Common name	Order	CS	No. broods	BS	No. offspring	BP_min	BP_max	No. migrants_min	No. migrants_max
1	<i>Acrocephalus arundinaceus</i>	great reed warbler	1	4.70	1.00	0.44	2.05	1.50E+06	2.90E+06	5.30E+06	1.02E+07
2	<i>A. paludicola</i>	aquatic warbler	1	5.00	1.50	0.68	5.07	1.20E+04	2.00E+04	6.41E+04	1.07E+05
3	<i>A. palustris</i>	marsh warbler	1	5.13 <sup>a</sup>	1.00	0.54	2.77	3.20E+06	6.80E+06	1.27E+07	2.69E+07
4	<i>A. schoenobaenus</i>	sedge warbler	1	5.25	1.00	0.54	2.84	4.40E+06	7.40E+06	1.76E+07	2.96E+07
5	<i>A. scirpaceus</i>	Eurasian reed-warbler	1	3.90	1.20	0.55	2.57	2.70E+06	5.00E+06	1.04E+07	1.92E+07
6	<i>A. campestris</i>	tawny pipit	1	4.18	1.00	0.68	2.84	1.00E+06	1.90E+06	4.01E+06	7.61E+06
7	<i>A. cervinus</i>	red-throated pipit	1	5.50	1.00	0.62	3.41	1.00E+06	3.00E+06	4.35E+06	1.30E+07
8	<i>A. trivialis</i>	tree pipit	1	4.61	1.50	0.54	3.73	2.70E+07	4.20E+07	1.23E+08	1.91E+08
9	<i>Apus apus</i>	common swift	2	2.35	1.00	0.64	1.50	6.90E+06	1.70E+07	2.21E+07	5.44E+07
10	<i>A. pallidus</i>	pallid swift	2	2.50	2.00	0.41	2.05	3.90E+04	1.60E+05	1.38E+05	5.65E+05
11	<i>Calandrella brachydactyla</i>	greater short-toed lark	1	3.50	2.00	0.40 <sup>f</sup>	2.80	7.30E+06	1.40E+07	2.91E+07	5.57E+07
12	<i>Caprimulgus europaeus</i>	Eurasian nightjar	2	2.00	1.50	0.48	1.44	4.70E+05	1.00E+06	1.49E+06	3.16E+06
13	<i>C. ruficollis</i>	red-necked nightjar	2	2.00	1.50	0.48 <sup>g</sup>	1.44	2.10E+04	1.10E+05	6.64E+04	3.48E+05
14	<i>Coracias garrulus</i>	European roller	2	3.80	1.00	0.92	3.50 <sup>p</sup>	5.30E+04	1.10E+05	2.33E+05	4.84E+05
15	<i>Coturnix coturnix</i>	common quail	2	10.20	1.00	0.44 <sup>h</sup>	4.49	2.80E+06	4.70E+06	1.12E+07	1.88E+07
16	<i>Cuculus canorus</i>	common cuckoo	2	9.20	1.00	0.30	2.76	4.20E+06	8.60E+06	1.66E+07	3.40E+07
17	<i>Delichon urbica</i>	common house martin	1	4.10	1.50	0.71	4.37	9.90E+06	2.40E+07	4.87E+07	1.18E+08
18	<i>Emberiza hortulana</i>	ortolan bunting	1	4.60	1.00	0.51	2.35	5.20E+06	1.60E+07	1.93E+07	5.93E+07
19	<i>Erythropygia galactotes</i>	rufous-tailed scrub robin	1	3.50	2.00	0.44	3.08	3.20E+04	9.60E+04	1.33E+05	3.98E+05
20	<i>Ficedula albicollis</i>	collared flycatcher	1	5.93	1.00	0.61	3.63	1.40E+06	2.40E+06	6.27E+06	1.07E+07
21	<i>F. hypoleuca</i>	European pied flycatcher	1	5.92	1.00	0.70	4.14	1.20E+07	2.00E+07	5.74E+07	9.57E+07
22	<i>F. semitorquata</i>	semicollared flycatcher	1	5.50	1.00 <sup>b</sup>	0.66 <sup>b</sup>	3.61	1.50E+04	5.30E+04	6.70E+04	2.37E+05
23	<i>Hippolais icterina</i>	icterine warbler	1	4.80	1.00	0.76	3.65	3.50E+06	7.10E+06	1.57E+07	3.19E+07
24	<i>H. languida</i>	Upcher's warbler	1	4.00	1.00 <sup>c</sup>	0.62 <sup>i</sup>	2.46	1.40E+04	3.70E+04	5.29E+04	1.40E+05
25	<i>H. olivetorum</i>	olive-tree warbler	1	3.80	1.00	0.62 <sup>i</sup>	2.34	1.10E+04	2.30E+04	4.07E+04	8.52E+04
26	<i>H. pallida</i>	eastern olivaceous warbler	1	3.40	1.00 <sup>c</sup>	0.62 <sup>i</sup>	2.09	3.30E+06	6.70E+06	1.17E+07	2.38E+07
27	<i>H. polyglotta</i>	melodious warbler	1	4.30	1.00	0.47	2.02	1.00E+06	3.00E+06	3.51E+06	1.05E+07
28	<i>Hirundo daurica</i>	red-rumped swallow	1	4.32	2.20	0.74	7.07	1.00E+05	4.30E+05	6.54E+05	2.81E+06
29	<i>H. rustica</i>	barn swallow	1	4.54	1.50	0.82	5.58	1.60E+07	3.60E+07	9.04E+07	2.03E+08
30	<i>Jynx torquilla</i>	Eurasian wryneck	2	8.40	1.20	0.60	6.05	5.80E+05	1.30E+06	3.44E+06	7.71E+06

31	<i>Lanius collurio</i>	red-backed shrike	1	5.07	1.00	0.65	3.30	6.30E+06	1.30E+07	2.69E+07	5.56E+07
32	<i>L. minor</i>	lesser grey shrike	1	5.80	1.00	0.55 <sup>i</sup>	3.19	6.20E+05	1.50E+06	2.61E+06	6.32E+06
33	<i>L. nubicus</i>	masked shrike	1	4.70	2.00	0.55 <sup>i</sup>	5.17	3.50E+04	1.00E+05	1.89E+05	5.40E+05
34	<i>L. senator</i>	woodchat shrike	1	5.20	1.00	0.46	2.39	4.80E+05	1.20E+06	1.79E+06	4.48E+06
35	<i>Locustella fluviatilis</i>	river warbler	1	4.90	1.40	0.39	2.68	1.90E+06	4.60E+06	7.42E+06	1.80E+07
36	<i>L. luscinioides</i>	Savi's warbler	1	4.60	1.30	0.42	2.51	5.30E+05	8.00E+05	2.02E+06	3.05E+06
37	<i>L. naevia</i>	common grasshopper warbler	1	5.40	2.00	0.40 <sup>k</sup>	4.32	8.40E+05	2.20E+06	4.11E+06	1.08E+07
38	<i>Luscinia luscinia</i>	thrush nightingale	1	4.80	1.00	0.77	3.70	3.70E+06	6.90E+06	1.67E+07	3.12E+07
39	<i>L. megarhynchos</i>	common nightingale	1	4.82	1.50	0.77 <sup>l</sup>	5.57	4.20E+06	1.20E+07	2.37E+07	6.77E+07
40	<i>L. svecica</i>	bluethroat	1	6.19	1.50	0.58	5.34	4.50E+06	7.80E+06	2.46E+07	4.25E+07
41	<i>Merops apiaster</i>	European bee-eater	2	6.00	1.00	0.70	4.20	4.80E+05	1.00E+06	2.31E+06	4.82E+06
42	<i>M. persicus</i>	blue-cheeked bee-eater	2	6.00	1.00 <sup>d</sup>	0.70 <sup>d</sup>	4.20	3.10E+03	1.00E+04	1.49E+04	4.82E+04
43	<i>Monticola saxatilis</i>	rufous-tailed rock thrush	1	4.50	1.00 <sup>c</sup>	0.67 <sup>m</sup>	3.02	1.00E+05	3.20E+05	4.11E+05	1.31E+06
44	<i>Motacilla flava</i>	western yellow wagtail	1	5.45	1.00	0.59	3.22	7.90E+06	1.40E+07	3.34E+07	5.92E+07
45	<i>Muscicapa striata</i>	spotted flycatcher	1	4.30	2.00	0.66	5.68	1.40E+07	2.20E+07	7.99E+07	1.26E+08
46	<i>Oenanthe cypriaca</i>	Cyprus wheatear	1	4.50	1.20	0.67 <sup>m</sup>	3.62	9.00E+04	1.80E+05	4.02E+05	8.05E+05
47	<i>O. hispanica</i>	black-eared wheatear	1	5.30	1.50	0.67 <sup>m</sup>	5.33	1.40E+06	3.30E+06	7.69E+06	1.81E+07
48	<i>O. isabellina</i>	isabelline wheatear	1	5.30	1.35	0.62	4.44	2.10E+06	6.30E+06	1.04E+07	3.13E+07
49	<i>O. oenanthe</i>	northern wheatear	1	6.00	1.47	0.72	6.35	4.60E+06	1.30E+07	2.81E+07	7.94E+07
50	<i>Oriolus oriolus</i>	Eurasian golden oriole	1	3.80	1.00	0.71	2.70	3.40E+06	7.10E+06	1.33E+07	2.78E+07
51	<i>Phoenicurus phoenicurus</i>	common redstart	1	6.15	1.60	0.75	7.37	6.80E+06	1.60E+07	4.57E+07	1.08E+08
52	<i>Phylloscopus bonelli</i>	western Bonelli's warbler	1	5.30	1.00	0.49 <sup>n</sup>	2.61	1.40E+06	3.50E+06	5.42E+06	1.35E+07
53	<i>P. collybita</i>	common chiffchaff	1	5.50	1.70	0.51	4.77	3.00E+07	6.00E+07	1.07E+08	1.74E+08
54	<i>P. sibilatrix</i>	wood warbler	1	5.85	1.00	0.41	2.40	1.40E+07	2.20E+07	5.23E+07	8.23E+07
55	<i>P. trochilus</i>	willow warbler	1	6.32	1.00	0.56	3.54	5.60E+07	1.00E+08	2.48E+08	4.42E+08
56	<i>Riparia riparia</i>	sand martin	1	4.78	1.70	0.64	5.20	5.40E+06	9.50E+06	2.93E+07	5.15E+07
57	<i>Saxicola rubetra</i>	whinchat	1	5.93	1.00	0.48	2.85	5.40E+06	1.00E+07	2.16E+07	4.01E+07
58	<i>Streptopelia turtur</i>	European turtle dove	2	1.90	2.50	0.38	1.81	3.50E+06	7.20E+06	1.18E+07	2.44E+07
59	<i>Sylvia atricapilla</i>	Eurasian blackcap	1	4.60	1.10	0.51	2.58	2.50E+07	4.90E+07	4.79E+07	7.74E+07
60	<i>S. borin</i>	garden warbler	1	4.50	1.00	0.49	2.21	1.70E+07	3.10E+07	6.16E+07	1.12E+08
61	<i>S. cantillans</i>	subalpine warbler	1	4.20	2.00	0.50 <sup>c</sup>	4.20	1.40E+06	3.20E+06	6.75E+06	1.54E+07
62	<i>S. communis</i>	common whitethroat	1	4.67	1.30	0.57	3.46	1.40E+07	2.50E+07	6.13E+07	1.09E+08
63	<i>S. curruca</i>	lesser whitethroat	1	4.86	1.00	0.52	2.53	4.80E+06	7.80E+06	1.83E+07	2.98E+07
64	<i>S. hortensis</i>	orphan warbler	1	4.20	1.00	0.34	1.43	1.70E+05	4.80E+05	5.37E+05	1.52E+06
65	<i>S. nisoria</i>	barred warbler	1	4.70	1.00	0.76	3.57	4.60E+05	1.00E+06	2.04E+06	4.44E+06
66	<i>S. rueppelli</i>	Rueppell's warbler	1	4.50	1.00 <sup>c</sup>	0.50 <sup>c</sup>	2.25	2.00E+05	6.10E+05	7.30E+05	2.23E+06
67	<i>Tachymarptis melba</i>	alpine swift	2	2.50	1.00	0.66	1.65	1.40E+05	3.30E+05	4.61E+05	1.09E+06
68	<i>Upupa epops</i>	Eurasian hoopoe	2	7.00	1.00	0.53	3.68	8.90E+05	1.70E+06	2.30E+06	4.48E+06

Superscripts indicate values derived from averages of the closest relatives if not stated otherwise. Superscript a: mean (no. 2, 4), b: mean (no. 20, 21), c: mean (no. 23, 25, 27), d: no. 41, e: assumed, f: based on *Alauda arvensis* (Cramp 1998), g: no. 12, h: based on *Perdix perdix* (Cramp 1998), i: mean (no. 23, 27), j: mean (no. 31, 34), k: mean (no. 35, 36), l: no. 38, m: mean (no. 48, 49), n: mean (no. 53, 54, 55), p: Aviles et al. (2000).

Table A2. Estimation of the number of breeding pairs not migrating to tropical Africa. Data are given as minimum and maximum numbers of breeding pairs per country derived from BirdLife

International (2004), 'Prop' is the assumed proportion of non-migrants for each country (either 0.5 or 1.0), 'total' gives the sum of breeding pairs not migrating and '%TBP' the corresponding percentage within the total European breeding population. For common quail (*Coturnix coturnix*) we set %TBP tentatively to 20% (del Hoyo et al. 1994). Countries are abbreviated after ISO standard.

Country	Prop	Bluethroat <i>Luscinia svecica</i>		Prop	Common chiffchaff <i>Phylloscopus collybita</i>		Prop	Eurasian backcap <i>Sylvia atricapilla</i>		Prop	Eurasian hoopoe <i>Upupa epops</i>	
		BP_min	BP_max		BP_min	BP_max		BP_min	BP_max		BP_min	BP_max
AL				1.0	2000	5000	1.0	20000	50000	0.5	1000	2000
AT	0.5	250	350	0.5	600000	1000000	0.5	700000	1400000			
BE	0.5	3100	4100	0.5	100000	250000	0.5	100000	250000			
BG				1.0	300000	1000000	1.0	800000	2000000	0.5	4000	8000
CH	0.5	1	7	0.5	200000	300000	0.5	200000	300000			
CS	1.0	100	150	1.0	450000	750000	1.0	1000000	1500000	0.5	10000	14000
CZ	0.5	400	600	0.5	800000	1600000	0.5	800000	1600000			
DE	0.5	3300	4600	0.5	2400000	4000000	0.5	2000000	3500000			
ES	1.0	9000	12800	1.0	40000	60000	1.0	850000	1500000	0.5	497000	710000
FR	1.0	10000	40000	1.0	3000000	15000000	1.0	2500000	10000000	0.5	30000	50000
GB				1.0	807000	807000	1.0	932000	932000			
GR				1.0	20000	50000	1.0	5000	20000	0.5	5000	20000
HR	1.0	50	75	1.0	500000	800000	1.0	500000	1000000	0.5	3500	7000
HU	0.5	500	800	0.5	520000	720000	0.5	790000	1050000			
IE				1.0	20000	100000	1.0	10000	20000			
IT				1.0	300000	800000	1.0	2000000	5000000	0.5	20000	50000
MK				1.0	50000	300000	1.0	60000	150000	0.5	3000	10000
NL	0.5	9000	11000	0.5	550000	600000	0.5	270000	320000			
PL	1.0	0	5	1.0	10	100	1.0	50000	500000	0.5	10000	100000
RO	0.5	1500	3500	0.5	980000	1600000	0.5	650000	900000	0.5	24000	42000
SI				1.0	400000	600000	1.0	600000	900000	0.5	600	1000
SK	0.5	15	30	0.5	600000	1000000	0.5	800000	1000000			
TR	1.0	1000	3000	1.0	100000	400000	1.0	80000	160000	0.5	150000	400000
Total		14976	33895		9364010	26207100		12562000	28892000		379050	707000
% TBP		0.3	0.4		31.2	43.7		50.2	59.0		42.6	41.6

## References

- Aviles, J. M. et al. 2000. Nest-site selection and breeding success in the roller (*Coracias garrulus*) in the southwest of the Iberian peninsula. – J. Ornithol. 141: 345–350.
- BirdLife International 2004. Birds in Europe: population estimates, trends and conservation status. – BirdLife International.
- Cramp, S. 1998. The complete birds of the western Palearctic. – Oxford Univ. Press.
- del Hoyo, J. et al. 1994. Handbook of the birds of the world. – Lynx Edicions.
- Glutz von Blotzheim, U. N. and Bauer, K. M. 1987. Handbuch der Vögel Mitteleuropas. – Aula-Verlag.