BTO Research Report No 453

Declines of Afro-Palaearctic Migrants: Reviewing Current Information and Developing Hypotheses

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1. SUMMARY

1. Across Europe a wide range of Palaearctic migrant species are declining, particularly those which migrate long distances. The long-term demographic datasets held by the British Trust for Ornithology (BTO) have proved extremely useful in diagnosing the causes population declines of British bird species. In this review, we assess the data availability for migrant species and suggest some proposed analyses to investigate potential causes of the declines.
2. Information on abundance of migrant species is available from a number of schemes, notably the Common Birds Census (CBC) and Breeding Bird Survey (BBS), though Constant Effort Site (CES) ringing may also provide useful information. A preliminary analysis of the BBS data suggests that more long-distance migrant species have declined than either resident or short-distance migrant species.
3. Estimates of per attempt nesting productivity are available from the nest record scheme for a wide range of migrant species. Data are available in sufficient numbers to permit regional analyses. CES provides information on whole season productivity (recruitment into the full-grown population) for a more restricted range of species. From a preliminary analysis of CES data there is no indication that the productivity of migrant species has declined along with their population abundance. CES schemes operate in many European countries allowing broader scale analyses of productivity (in particular).
4. Information on annual survival is available from two sources: general ringing totals, though only for a few species can age-specific survival rates be calculated; and, CES, from which annual adult survival is estimable. RAS provides information on adult survival in four long-distance migrant species (House Martin *Delichon urbicum* Barn Swallow *Hirundo rustica*, Sand Martin *Riparia riparia* and Pied Flycatcher *Ficedula hypoleuca*). Analyses have shown that survival in the three hirundine species is remarkably similar, at least in the last decade.
5. Ringing data at a European scale are available through the Euring Databank (EDB) hosted by the BTO. These provide information on migratory movements for a large range of species, though most information comes from relatively few countries (notably Germany and the United Kingdom), and relatively few species have good numbers of recoveries from Africa to enable identification of wintering grounds.

2. INTRODUCTION

Across Europe, a wide range of populations of Afro-Palaearctic migrants with a range of differing ecologies have been declining, suggesting that factors linked to their migratory nature are involved (Sanderson *et al.* 2006). There are a wide range of potential ecological drivers of these declines, operating both on breeding and wintering grounds, and also possibly on passage or at stopover sites (Newton 2004). In order to affect population size, such ecological factors will have impacts either on a species' fecundity or survival. Identifying such demographic impacts can help considerably in determining relevant factors for further study and management actions (eg Baillie 2001).

The unique large-scale datasets held by the BTO on the demography of Britain's bird populations have been invaluable in determining possible causes and management actions in a suite of farmland species, through its Integrated Population Monitoring Programme (IPM, eg Fuller *et al.* 1995; Peach *et al.* 1999; Crick *et al.* 2002; Robinson *et al.* 2004). The only migrant species for which an IPM analysis has been carried out is Spotted Flycatcher *Muscicapa striata* (Freeman *et al.* 2002), although key factor analyses for a representative range of migratory species were carried out by Baillie & Peach (1992) and population analyses of Willow Warblers are planned. Although the power available was low, due to restricted sample sizes, this concluded that changes in survival were most consistent with the observed population decline. In this report, we briefly summarise the availability of information about demographic parameters for migrant species from the BTO's datasets with a view to identifying potential analyses that would be useful in furthering our understanding of the widespread declines in migrant species.

3. DATA AVAILABILITY

Table 1 lists the availability of data for each demographic parameter by scheme for 26 common Afro-Palaearctic migrant species, and gives a broad indication of the amount of data available for each scheme (in terms of the number of sites covered each year).

Abundance

Information on numbers of (adult/breeding) birds is available from four schemes (Baillie *et al.* 2006): the Common Birds Census (CBC, 1962-2000), Waterways Birds Survey (WBS, 1974-present), Breeding Bird Survey (BBS, 1994-present), and Constant Effort ringing sites (CES, 1983 to present). CBC allows detailed information on long-term trends (subject to certain caveats), and potential habitat associations to be identified; the WBS provides similar information for a limited suite of waterbird species. Both CBC and WBS survey plots are non randomly selected, so the CBC has been replaced by the BBS as the core population monitoring survey, and, similarly the Waterways Breeding Bird Survey (WBBS) has been running in parallel with the WBS since 1998. The BBS provides a much larger scale survey (a ten-fold increase in number of sites over CBC) with a statistically stratified, random selection of plots across the entire country; some general habitat information is also recorded on each plot. Consequently, a much greater number of species can be monitored. The BBS also allows a much greater capacity for regional analysis compared to CBC, but may be less appropriate for fine-scale analyses.

A broad analysis of BBS population trends over the last ten years (Table 2) shows that fewer resident species are decreasing (30% of 50 species) than are migrant species (52% of 48) and that amongst migrants species more trans-Saharan migrants are declining significantly (42%) than either short-distance migrants, which generally migrate within Britain or the near-Continent (20%) or longer-distance migrants within Europe (33%). Only trans-Saharan migrants show a negative trend averaged across species (even when those shorter distance migrant species that have increased strongly: Greylag *Anser anser*, Canada Goose *Branta canadensis*, and Stonechat *Saxicola torquata* are excluded).

CES provides detailed mark-recapture information for c. 120 sites each year, mostly in reedbed and scrub habitats (Table 5). Consequently, it only provides information on abundance for species using these habitats, though for Reed Warbler *Acrocephalus scirpaceus* and Sedge Warbler *A. schoenobaenus* it probably provides the best estimate of national abundance. The great strength of the CES is that all three of the key demographic parameters, abundance, productivity and survival can be measured on the same sites, which is of great value when considering integrated population analyses.

Although CES type schemes originated in Britain, many other countries operate similar schemes, notably Finland, France, Spain and the Netherlands (Table 3). This would potentially allow analyses of abundance at a much larger geographic scale and some preliminary analyses have already been undertaken. Similarly, census schemes are now operational in many European countries (eg PECBM 2006), allowing a detailed assessment of population trends across Europe since 1980. Of the 69 species for which long-term trends are available, around 20 species are long-distance migrants, giving good scope for comparative analyses of patterns of annual fluctuations in numbers in relation to environmental and other factors.

Productivity

In Britain, there are two primary schemes for analysing productivity, though they give slightly different measures.

The Nest Record Scheme provides long-term estimates of productivity per nesting attempt for a wide range of species (Crick *et al.* 2003, Table 4). The strength of this scheme, is that the different components of productivity can be separated (clutch size, brood size, hatching success, daily failure rates) allowing close examination of factors that might potentially affect breeding success. For many species, the number of records is sufficient to conduct a regional analysis of trends in per attempt productivity. In Table 4, we provide a regional break-down of the number of records submitted in each decade for each species that have been computerised. For some species additional records may be available for computerisation (for example, it is planned to computerise a large number of additional Swallow *Hirundo rustica* records in the near future) computerisation of records for other species will require appropriate funding. The development of a nest-recording module within the IPMR data submission software will also mean an increasing number of records will be available for analysis, even for previous years, as many recorders are taking the opportunity to computerise historical records.

CES measures productivity for a smaller range of species (Table 5), and provides a measure of recruitment into the juvenile population. Thus its measure of productivity integrates nesting success per attempt, number of attempts and a component of post-fledging survival.

In general, productivity for many species has gradually increased over time, though with some notable exceptions (Baillie *et al.* 2006). This may reflect broad changes in climate (Crick & Sparks 1999), or, amongst declining species, density-dependent compensation, possibly in combination with other factors. In an initial attempt to investigate whether changes in productivity may have been at least partly responsible for the declines in migrant species, we summarised information on population trends on CES sites over two time periods, the length of the scheme (19 years) and the most recent 10 years, together with changes in productivity over the same time periods (Table 5). We did this separately for resident species, short-distance migrants (ie those that migrated within Europe) and long-distance migrants (ie trans-Saharan migrants); migratory status was derived from analyses presented in Wernham *et al.* (2002).

Over the longer time period, long-distance migrants saw the greatest decline in numbers (averaging 32%), but productivity did not decline much (6%) and certainly no more so than for resident species (Table 5). Productivity of short-distance migrants did, however decline markedly (41%) in the same period, though this was heavily influenced by one species (Linnet *Carduelis cannabina*, excluding this point, productivity declined by 32%), despite an overall population increase. Looking between species, there was no evidence of a relationship between trends in population size and trends in productivity (Fig. 1). In the last ten years a decline in population size (32%) of long-distance migrants has been associated with a small decline in productivity (12%), but declines in productivity of resident (13%) and short-distance migrant (22%) species have been greater (Table 5). Again there was no apparent relationship among individual species between population and productivity trends.

Such a simple analysis suggests that trends in productivity are unlikely to be the primary cause of the observed declines in migrant species, particularly of long-distance migrants. However, as alluded to earlier, productivity is likely to be density dependent, as a result of which, only relatively short-term changes in productivity may be apparent, yet be sufficient to cause sustained population decline (Green 1999). Consequently, this subject will repay closer analysis before discarding the hypothesis that productivity is an important driver of the population trends.

As a number of countries operate CES-style schemes, Europe-wide analyses of productivity of certain species could be undertaken. In assessing productivity the timing over which CES visits are made is important. Thus, some countries, notably France, only operate during the early part of the breeding season (partly to avoid catching returning migrants, Table 3), thus productivity patterns in species that breed later in the season may not be so well monitored. Table 6 details the species commonly caught

by each of the more established schemes and hence for which pan-European analyses are likely to be most useful. Preliminary analyses have indicated that large-scale patterns of productivity (and abundance) exist across Europe (R. Julliard pers. comm.), for example, the annual pattern of fluctuations in productivity of Blackcap *Sylvia atricapilla* is remarkably similar between Britain and France (Fig. 2), showing the utility of this approach.

Survival

Although IPMs have shown survival to be an important factor driving the pattern of population change in many of the species that have been studied (eg Peach *et al.* 1999; Siriwardena *et al.* 1999; Crick *et al.* 2002; Robinson *et al.* 2004), monitoring of survival is not so well-developed as monitoring of productivity. There are three schemes through which survival of British birds can be monitored. The largest is the Britain & Ireland ringing scheme (Clark *et al.* 2005), from which through marking large numbers of birds, survival rates can be estimated from the number of birds re-captured or found dead. A short-coming of this data-set, particularly for many passerines, is the lack of numbers of birds ringed by age-category (ie juvenile and adult birds) each year, meaning age-specific survival rates (juveniles almost invariably have lower survival rates than adults) are hard to estimate, due to confounding trends in (age-specific) probabilities of birds being reported. Age-specific ringing totals are available for seven migratory species (Sand Martin, Swallow, Reed Warbler, Sedge Warbler, Blackcap, Willow Warbler and Pied Flycatcher) from 1985, allowing robust estimates of annual survival to be calculated for the last twenty years. From the mid-1990s, cohort ringing totals are more available as ringers were encouraged to submit data electronically. However, even general ringing data such as these still have the potential to provide useful information (eg Freeman *et al.* 2002).

Since autumn 2005, the BTO has also hosted the EURING DataBank (EDB) on behalf of the European Union of Bird Ringing Schemes (EURING), which greatly expands the geographic scope for some analyses and which may be more appropriate for migrant species (Table 7). The EDB consists of information on birds recovered from schemes operating in Europe. Although the EDB (like many ringing schemes) does not contain totals of birds ringed, analyses of survival have not really been carried out a European scale, so even simple analyses of these data are likely to yield useful information.

Perhaps the best information for migrant passerines on survival rates, at least for those species caught in sufficient numbers, will be the CES (Table 5). Methods for analysing survival rates across the large number of sites contributing to CES are being developed, and suggest that sensible annual estimates can be produced for many species (S.N. Freeman pers comm.). Given the complexity of the analyses, it is probably not feasible to calculate Europe-wide trends in survival from CES data at present, though calculation and comparison of country specific trends should be possible.

For a limited number of species, the Retrapping Adults for Survival (RAS) scheme, which commenced formally in 1998 will provide robust estimates of annual survival. This scheme is still growing, and it is hoped that it may be possible to monitor more species in the future. The annual pattern of survival for the three common hirundine species in Britain (Swallow, Sand Martin *Riparia riparia* and House Martin *Delichon urbicum*) are remarkably similar (Fig. 3) at least for the limited period over which estimates are available for all species, despite being thought to winter in very different areas of Africa. This might suggest that ecological factors, the breeding grounds or more likely on passage, may be particularly important for the pattern of survival.

Movements

Large numbers of migrant species are ringed each year throughout Europe to provide information on movements and survival rates. Ringing and finding details of those birds that are subsequently found dead or are controlled by another ringer are held in the EDB. Of the 121 migrant species considered by Sanderson *et al.* (2006), 112 are represented in the EDB, with some 270,000 records available. Most of these (90%) are ringed in just seven countries Belgium (5%), Britain (25%), Germany (38%), the Netherlands (7%), Spain (5%), Sweden (6%) and Switzerland (4%) (Table 7). Relatively few of these have been subsequently recovered in Africa, with details of only some 11,000 birds (4%) being held by the EDB (Table 8). Only seven species have more than 500 records of birds found in Africa, and together they comprise 65% of all such recoveries in the EDB: White Stork (887), Common Tern (1572), Caspian Tern (573), Sandwich Tern (2437), Swallow (643), Sand Martin (565) and Reed Warbler (600). Full details are available in an accompanying Excel spreadsheet, available from the authors.

3.1 Suggestions for Future Work

- A review of trends in abundance in the British populations of migrant species, including a review of the demographic analyses that have been undertaken so far and summarising the likely ecological factors causing population change. Such a review proved very useful in highlighting the declines in farmland birds (Fuller *et al.* 1995). This exercise might also be usefully repeated at a European scale, using data from the Pan-European Common Bird Monitoring scheme (PECBM), extending the work of Sanderson *et al.* (2006).
- Detailed analysis of productivity trends in Britain from CES sites, incorporating the impacts of climatic factors and local density to determine if the declines are related to changes in breeding performance.
- Analysis of productivity at a European scale using data from European CES schemes. Preliminary analyses of these, using areas similar to the regions used for producing summary indices by PECBM, undertaken by CRPBO and BTO, are underway, but a full analysis is yet to be funded (there is potential some funding towards this from BTO). In particular, analysing productivity patterns by bioclimatic regions would prove interesting.
- Analysis of productivity using Nest Record data, investigating regional differences in trends and annual patterns.
- Analysis of age-specific survival rates of the seven species (Sand Martin, Swallow, Pied Flycatcher, Reed Warbler, Sedge Warbler, Blackcap, Willow Warbler) for which age-specific ringing totals are available, providing an opportunity to compare and contrast between species' with different ecological traits.
- Analysis of survival rates across Europe using recovery data from the EDB. Such an analysis would have to be carried out without age/specific totals, but would prove useful in highlighting regional trends which may highlight areas of particular interest or concern.
- Full IPM analyses using new methods developed at the BTO – possibly a comparison between contrasting species, such as Sedge Warbler and Reed Warbler.
- European-wide analysis of migration routes and timing. BTO have recently developed a novel method of mapping migration routes, using GAMs in combination with GIS technology to identify different populations and migration routes. These techniques have been applied very successfully to mapping the movements of waterfowl using recovery data from Britain (Fig. 4), will provide useful insights for migrant passerines, objectively identifying migratory patterns and flyways for passerine populations across Europe. A greater understanding of these opens up the possibility of undertaking flyway-specific survival analyses and investigation of factors affecting populations along specific routes.

- Combining data sources to estimate annual survival rates, and to partition these estimates into survival rates during the breeding, wintering and passage areas. This would provide a powerful insight into the relevant ecological mechanisms of population change, but would need an exploratory analysis to determine whether it is feasible, at least for one or two species.
- Analysis of biometric data which are increasingly being computerised, to provide details on migration strategies, particularly fattening schedules. It may also be possible to do this at a European scale, for example the recent EURING project on Swallows, of which the BTOs Swallow Roost Project is a part. We are currently have plans to use ringers and the CES network to collect data on movements and fattening rates in *Acrocephalus* species in a project starting autumn 2007 and are looking for funding for this.
- Analyses of timing of arrival/breeding and changes in this for short/long and partial migrants; such mismatches in phenology have been shown to be important in determining local population trends in at least the Pied Flycatcher (Both *et al.* 2006).

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Table 1 Availability of data on demographic parameters from large-scale BTO schemes for common migrant species (Baillie *et al.* 2005). For each scheme, the approximate annual number of sites sampled over the last thirty years is given (for NRS the number of records); for schemes monitoring survival (CES & RAS) the ability to generate annual estimates currently is noted.

	Abundance			Productivity			Survival	
	CBC	**WBS**	**BBS**	**CES**	**CES**	**NRS**	**CES**	**RAS**
Hobby								
Common Sandpiper		27	93			14		
Turtle Dove	59		192			15		
Cuckoo	104		749					
Swift			870					
Swallow	78		1407			204		Y
Sand Martin		18	96			14		Y
House Martin	22		721					Y
Tree Pipit	33		124			15		
Yellow Wagtail	27	21	157					
Redstart	23		132			64		
Whinchat			80			23		
Wheatear			236			32		
Nightingale				11	13			
Grasshopper Warbler	5		59					
Reed Warbler	24	19	85	52	59	107	Y	
Sedge Warbler	44	44	241	63	68	49	Y	
Lesser Whitethroat	55		202	43	57		Y	
Whitethroat	118	40	969	57	73	40	Y	
Garden Warbler	85		373	67	79	20	Y	
Blackcap	156		1026	85	93	39	Y	
Wood Warbler			58			24		
Chiffchaff	132		918	63	83	31	Y	
Willow Warbler	189		1224	92	98	96	Y	
Spotted Flycatcher	69		199	18	24	114		
Pied Flycatcher			43					Y

CBC – Common Birds Census; WBS – Waterways Bird Survey; BBS – Breeding Bird Survey; CES – Constant Effort Sites ringing scheme; NRS – Nest Record Scheme; RAS – Retrapping Adults for Survival ringing scheme

Table 2 Population trends in migrant and resident species for the period 1994-2005 on BBS squares. N is the number of squares. Significant trends are highlighted in bold, declining trends in italics. Migratory status was derived from analyses presented in Wernham *et al.* (2002); for migrants, the proportion of the population that is migratory (N. Mig) is indicated on an arbitrary four point scale (1 - least migrant, to 4 - most migrant).

Species	N	Trend	Species	N	Trend	N Mig.
Residents			**Short-Distance Migrants**			
Mute Swan	192	**26**	Canada Goose	346	**153**	1
Greylag Goose	107	**255**	Kestrel	545	***-18***	1
Mallard	1013	**25**	Blackbird	1952	**22**	1
Red Grouse	102	*-15*	Song Thrush	1538	**18**	1
Red-legged Partridge	421	**55**	Mistle Thrush	1014	*-7*	1
Grey Partridge	215	***-40***	Tufted Duck	127	**38**	2
Pheasant	1370	**32**	(Cormorant)	175	**22**	2
(Grey Heron)	535	**29**	Oystercatcher	251	***-12***	2
Sparrowhawk	288	*-2*	Snipe	125	**36**	2
Buzzard	582	**60**	Curlew	433	***-36***	2
Moorhen	538	**20**	Redshank	71	*-12*	2
Coot	212	**79**	Shelduck	120	**59**	3
Feral Pigeon	567	7	Grey Wagtail	177	**75**	3
Stock Dove	633	9	Siskin	112	*-3*	4
Wood Pigeon	1967	**19**	Lesser Redpoll	125	**40**	4
Collared Dove	1077	**38**	Average		25	
Little Owl	91	*-19*				
(Tawny Owl)	79	*-2*	**Long-Distance Migrants**			
Kingfisher	45	*-5*	Lapwing	573	***-21***	2
Green Woodpecker	615	**31**	Pied Wagtail	1048	**21**	2
Gt Spotted Woodpecker	705	**120**	Golden Plover	52	*-8*	3
Dipper	47	6	Goldfinch	1153	**35**	3
Wren	1936	**24**	Linnet	1064	***-7***	3
Dunnock	1618	**22**	Meadow Pipit	656	***-6***	4
Robin	1867	**17**	Blackcap	1167	**61**	4
Goldcrest	613	**71**	Chiffchaff	1081	**30**	4
Long-tailed Tit	701	0	Stonechat	104	**227**	4
Blue Tit	1825	**24**	**Average**		**37**	
Great Tit	1689	**44**				
Coal Tit	607	**35**	**trans-Saharan Migrants**			
Willow Tit	53	**-65**	Hobby	31	*-23*	4
Marsh Tit	129	**33**	Common Sandpiper	59	*-5*	4
Nuthatch	340	**71**	(Common Tern)	50	*-20*	4
Treecreeper	283	**23**	Turtle Dove	182	***-45***	4
Jay	571	*-5*	Cuckoo	711	***-29***	4
Magpie	1511	3	Swift	895	***-21***	4
Jackdaw	1298	**40**	Sand Martin	102	**38**	4
Rook	1059	*-7*	Swallow	1535	**32**	4
Carrion Crow	1847	**12**	House Martin	786	**38**	4
Hooded Crow	117	*-15*	Tree Pipit	119	***-27***	4
Raven	192	**124**	Yellow Wagtail	151	***-33***	4
Starling	1527	***-21***	Redstart	133	18	4
House Sparrow	1309	1	Whinchat	72	***-36***	4
Tree Sparrow	137	**23**	Wheatear	250	*-4*	4

Chaffinch	1953	**15**	Grasshopper Warbler	62	**50**	4
Greenfinch	1440	**43**	Sedge Warbler	251	10	4
Bullfinch	484	*-1*	Reed Warbler	95	**43**	4
Yellowhammer	1022	***-17***	Garden Warbler	381	*-8*	4
Reed Bunting	366	**30**	Lesser Whitethroat	214	***-35***	4
Corn Bunting	136	***-32***	Whitethroat	1057	**27**	4
Average		24	Wood Warbler	53	***-65***	4
			Willow Warbler	1215	1	4
			Spotted Flycatcher	195	***-26***	4
			Pied Flycatcher	41	***-30***	4
			Average		**-7**	

Table 3 Constant Effort (CE) ringing schemes operating in Europe, together with year of commencement, an indication of the number of sites operated in recent years and the seasonal coverage

Country	Scheme	Start Year	N Sites	Months	Notes
UK & Ireland	BTO	1983	125	April – August	Limited habitat
Finland	Mus. Nat. Hist.	1987	35	April – September	Limited habitat
France	CRPBO	1989	120	May – July	
Spain	ICO	1991	40	April – August	Catalonia
	SEO	1995	46	April – July	Castillan Spain
Netherlands	SOVON/CTO	1994	40	April – August	
Sweden	Mus Nat Hist	1996	29	May – August	
Germany	Hiddensee BRC	1997	26	May – August	E Germany
	Vogel Helgoland	1999	30	May – August	W Germany
Poland	Gdansk Orn Stn	1998	5	April – July	Limited habitat
Belgium	R Inst Nat Sci	1999	5	July – August	
Italy	INFS	2002	28	May – August	
Portugal	CEMPA	2002	12	March - July	
Czech Republic	Czech BRC	2003	20	May – July	Mostly reedbed
Hungary	Birdlife Hungary	2004	31	April – July	
Denmark	ZMUC	2004	4	May – August	Limited habitat
Serbia & Mont.	Nat Hist Mus	2005	4	April - July	

Table 4 Number of nest record cards that have been computerised for a range of migrant species by decade and region. England has been split into three geographic regions: North – Lancashire, Yorkshire and counties northwards; East – Notts., Leics., Northants., Bucks., Surrey, Sussex and counties eastwards; West – Derbys., Warwicks., Oxon, Berks., Hants. and counties westwards. Ireland refers to both Northern Ireland and the Republic of Ireland.

Blackcap								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		2	13	16	16	30		**77**
North England	2	15	66	72	62	185	22	**424**
East England	12	73	211	240	260	187	38	**1021**
West England	9	133	256	233	490	416	95	**1632**
Wales	19	5	13	21	41	59	31	**189**
Ireland				1	1	2	1	**5**
Total	**42**	**228**	**559**	**583**	**870**	**879**	**187**	**3348**

Chiffchaff								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		3	8	13	10	11		**45**
North England		8	34	32	48	77	36	**235**
East England	6	56	108	123	143	143	52	**631**
West England	12	141	246	185	428	670	181	**1863**
Wales	4	27	21	26	33	46	18	**175**
Ireland	1	6	4	8	4			**23**
Total	**23**	**241**	**421**	**387**	**666**	**947**	**287**	**2972**

Garden Warbler								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		12	6	8	20	17	4	**67**
North England	2	14	30	41	32	140	12	**271**
East England	5	47	99	112	159	118	10	**550**
West England	11	74	155	88	244	258	46	**876**
Wales	7	6	38	29	54	90	34	**258**
Ireland								
Total	**25**	**153**	**328**	**278**	**509**	**623**	**106**	**2022**

Grasshopper Warbler								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		1	10		3	3	1	**18**
North England	2	1	21	26	11	36	9	**106**
East England	2	4	16	24	11	11	1	**69**
West England	11	9	33	36	60	21	2	**172**
Wales		3	7	3	2	2		**17**
Ireland						1	4	**5**
Total	**15**	**18**	**87**	**89**	**87**	**74**	**17**	**387**

Table 4 continued

House Martin								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland							50	**50**
North England							23	**23**
East England							13	**13**
West England							5	**5**
Wales							91	**91**
Ireland							50	**50**
Total							23	**23**

Lesser Whitethroat								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland				3	3	4		**10**
North England	3	5	10	7	11	11	4	**51**
East England	9	29	96	107	57	43	8	**349**
West England	3	48	95	66	121	74	20	**427**
Wales	3	4	5	4	11	2		**29**
Ireland								
Total	**18**	**86**	**206**	**187**	**203**	**134**	**32**	**866**

Nightingale								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland								
North England		1	14				1	16
East England	2	29	72	68	53	24	15	263
West England	7	32	40	17	58	40		194
Wales								
Ireland								
Total	**9**	**62**	**126**	**85**	**111**	**64**	**16**	**473**

Pied Flycatcher								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland			4	61	22		21	**108**
North England			91	234	26		91	**442**
East England				1				**1**
West England			401	219	37		83	**740**
Wales			359	530	114		111	**1114**
Ireland				5				**5**
Total			**855**	**1050**	**199**		**306**	**2410**

Table 4 continued

Redstart								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland	3	126	47	176	605	526	86	**1569**
North England	9	94	260	357	368	275	54	**1417**
East England	3	23	116	105	114	118	19	**498**
West England	4	115	264	159	192	140	31	**905**
Wales	2	38	95	169	326	447	110	**1187**
Ireland								
Total	**21**	**396**	**782**	**966**	**1605**	**1506**	**300**	**5576**

Reed Warbler								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland								
North England			21	64	16	36	31	168
East England	109	179	914	1728	1133	835	601	5499
West England	2	216	628	1503	1143	846	269	4607
Wales			8	12	10	3	2	35
Ireland								
Total	**111**	**395**	**1571**	**3307**	**2302**	**1720**	**903**	**10309**

Ring Ouzel								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		10	22	117	192	141	6	**488**
North England		38	146	148	85	61	3	**481**
East England				1				**1**
West England		15	65	61	77	28	1	**247**
Wales		13	18	51	97	22		**201**
Ireland								
Total		**76**	**251**	**378**	**451**	**252**	**10**	**1418**

Sand Martin								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		17	13	8	16	236	395	**685**
North England	5	14	37	27	21	116	50	**270**
East England	2	53	13	15	37	17	17	**154**
West England		15	20	52	27	13	2	**129**
Wales		5	19	10	6		1	**41**
Ireland		11			20	2		**33**
Total	**7**	**115**	**102**	**112**	**127**	**384**	**465**	**1312**

Table 4 continued

Sedge Warbler								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		56	59	43	168	41	12	**379**
North England	3	48	63	105	227	232	32	**710**
East England	49	112	327	491	423	339	89	**1830**
West England	5	138	351	174	253	240	32	**1193**
Wales		28	25	7	49	50	18	**177**
Ireland	1	5	2		24	2	12	**46**
Total	**58**	**387**	**827**	**820**	**1144**	**904**	**195**	**4335**

Spotted Flycatcher								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland	1	71	105	233	289	279	48	**1026**
North England	23	86	304	419	373	440	84	**1729**
East England	87	301	551	650	668	406	120	**2783**
West England	56	526	919	989	670	463	272	**3895**
Wales	36	32	114	218	116	116	73	**705**
Ireland		7	6	65	62	20	5	**165**
Total	**203**	**1023**	**1999**	**2574**	**2178**	**1724**	**602**	**10303**

Swallow								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland			79	165	1414	449	129	**2236**
North England			313	178	1769	608	169	**3037**
East England			211	417	2014	652	224	**3518**
West England			296	206	1589	701	145	**2937**
Wales				50	245	242	112	**649**
Ireland					773	44	25	**842**
Total			**899**	**1016**	**7804**	**2696**	**804**	**13219**

Tree Pipit								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		11	13	32	59	24	2	**141**
North England	7	37	38	39	33	12	4	**170**
East England	3	26	89	170	177	124	152	**741**
West England	22	75	88	127	144	179	46	**681**
Wales	7	11	12	21	35	21	6	**113**
Ireland								
Total	**39**	**160**	**240**	**389**	**448**	**360**	**210**	**1846**

Table 4 continued

Wheatear								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland	8	38	53	281	711	537	28	**1656**
North England		28	40	73	248	45	6	**440**
East England	2	137	27	120	27	41	4	**358**
West England	4	13	95	131	153	78	1	**475**
Wales	77	156	32	70	176	179	26	**716**
Ireland			3	4	4	2		**13**
Total	**91**	**372**	**250**	**679**	**1319**	**882**	**65**	**3658**

Whinchat								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		26	69	131	330	69	2	**627**
North England	10	80	64	105	67	101	35	**462**
East England	6	16	19	47	69	22		**179**
West England		35	52	57	74	59	3	**280**
Wales		11	43	67	273	264	115	**773**
Ireland								
Total	**16**	**168**	**247**	**407**	**813**	**515**	**155**	**2321**

Whitethroat								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland	1	96	60	61	99	39	6	**362**
North England	16	139	181	109	96	136	51	**728**
East England	42	389	617	286	226	201	77	**1838**
West England	42	554	576	214	434	498	127	**2445**
Wales	17	55	45	24	41	25	6	**213**
Ireland		3	2	4	5		2	**16**
Total	**118**	**1236**	**1481**	**698**	**901**	**899**	**269**	**5602**

Willow Warbler								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland	7	127	157	259	308	242	59	**1159**
North England	33	136	462	357	297	312	38	**1635**
East England	36	164	365	600	833	320	43	**2361**
West England	57	352	482	517	844	487	142	**2881**
Wales	17	31	64	86	136	172	34	**540**
Ireland		7	28	31	134	3	55	**258**
Total	**150**	**817**	**1558**	**1850**	**2552**	**1536**	**371**	**8834**

Table 4 continued

Wood Warbler								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		12	12	46	66	67	6	**209**
North England	3	9	10	24	117	77	2	**242**
East England	2	14	117	70	50	14	7	**274**
West England	24	64	112	125	552	218	14	**1109**
Wales	26	10	54	68	200	134	76	**568**
Ireland					8			**8**
Total	**55**	**109**	**305**	**333**	**993**	**510**	**105**	**2410**

Yellow Wagtail								
Region	1940s	1950s	1960s	1970s	1980s	1990s	2000s	Total
Scotland		2			2	1		**5**
North England	4	34	49	46	42	36	2	**213**
East England	9	39	103	95	69	32	41	**388**
West England	1	71	93	68	83	41	1	**358**
Wales		2	16	16	5	4		**43**
Ireland				1				**1**
Total	**14**	**148**	**261**	**226**	**201**	**114**	**44**	**1008**

Table 5 Change in population index and index of species monitored by constant effort ringing for two time periods 1984-2003 (19 years) and 1993-2003 (10 years).

Species	Migration Strategy	Change Pop^{n} 84-03	Change Pop^{n} 93-03	Change Prod 84-03	Change Prod 93-03
Wren	Sedentary	1.63 (1.44-1.91)	1.24 (1.13-1.36)	0.97	0.87
Dunnock	Sedentary	1.03 (0.81-1.17)	1.24 (1.14-1.34)	0.98	0.88
Robin	Sedentary	1.61 (1.43-1.88)	1.26 (1.16-1.36)	0.80	0.74
Long-tailed Tit	Sedentary	1.46 (1.19-1.94)	1.15 (1.04-1.28)	0.79	0.80
Willow Tit	Sedentary	0.58 (0.25-0.91)	0.66 (0.39-0.92)	0.88	0.92
Blue Tit	Sedentary	1.04 (0.89-1.22)	1.13 (1.04-1.24)	0.66	0.77
Great Tit	Sedentary	1.15 (0.97-1.39)	1.25 (1.13-1.40)	0.79	0.80
Treecreeper	Sedentary	1.33 (0.97-1.98)	1.27 (1.01-1.57)	1.30	0.89
Chaffinch	Sedentary	1.28 (0.69-1.22)	0.97 (0.84-1.10)	1.77	1.08
Greenfinch	Sedentary	1.59 (0.84-2.61)	1.07 (0.84-0.31)	0.84	1.15
Bullfinch	Sedentary	0.83 (0.68-1.03)	0.97 (0.84-1.09)	0.99	0.99
Reed Bunting	Sedentary	0.56 (0.37-0.66)	0.79 (0.61-1.00)	0.50	0.54
Average		**1.17**	**1.08**	**0.94**	**0.87**
Blackbird	Short Migrant	0.98 (0.84-1.13)	0.85 (0.73-0.98)	0.69	0.75
Song Thrush	Short Migrant	0.80 (0.66-0.95)	1.03 (0.91-1.19)	0.67	1.18
Blackcap	Long Migrant	1.46 (1.20-1.76)	1.40 (1.27-1.53)	0.70	0.71
Chiffchaff	Long Migrant	3.01 (2.14-4.92)	2.25 (1.80-2.92)	0.81	0.62
Goldfinch	Long Migrant	1.31 (0.67-1.27)	1.19 (0.89-1.69)	0.51	0.79
Linnet	Long Migrant	0.10 (0.04-0.27)	0.35 (0.17-0.83)	0.16	0.61
Average		**1.28**	**1.17**	**0.59**	**0.78**
Sedge Warbler	Long Migrant	0.89 (0.62-1.12)	0.92 (0.79-1.06)	0.46	0.82
Reed Warbler	Long Migrant	0.79 (0.66-0.96)	1.12 (0.97-1.27)	1.22	0.82
Lesser Whitethroat	Long Migrant	0.48 (0.25-0.68)	0.52 (0.40-0.63)	1.21	0.79
Whitethroat	Long Migrant	0.76 (0.56-0.94)	1.10 (0.91-1.32)	1.35	0.94
Garden Warbler	Long Migrant	0.76 (0.52-1.06)	0.76 (0.64-0.89)	0.65	0.93
Willow Warbler	Long Migrant	0.39 (0.30-0.48)	0.57 (0.44-0.71)	0.75	0.98
Average		**0.68**	**0.83**	**0.94**	**0.88**

Table 6. Indicative number of adult birds of a range of migrant species caught by each CES scheme annually. Only species which are caught in useful numbers by more than one scheme are included. Number of individuals for the Swedish and Polish schemes were not available at the time of writing, but species that are caught commonly by these schemes are indicated. Schemes are ranked in order of overall size.

	UK	France	Spain (SEO)	Spain (ICO)	Netherlands	Finland	Italy	Sweden	Czech Rep.	Poland	Denmark
Number of Sites	125	120	46	40	40	35	28	29	20	5	4
Nightingale	37	106	214	352			96		178		30
Sedge Warbler	929	135			467	304				1	
Reed Warbler	1552	421	935	152	1096	42	444	1	103	1	452
Marsh Warbler		23			160		56			1	168
Gt Reed Warbler			180	25			126				
Icterine Warbler					22						
Melodious Warbler		56	165	187			71		129		
Subalpine Warbler			22	86					68		
Lesser Whitethroat	108	14			44	32				1	22
Whitethroat	353	111			148	166	27	1		1	54
Garden Warbler	366	83	92		258	170		1		1	121
Blackcap	1241	479	165	316	338	26	235	1	172	1	184
Chiffchaff	468	144	67		753						66
Willow Warbler	1090	39	45		659	458		1		1	36

Table 7. Number of migrant species ringed in Europe which have been recovered anywhere. Numbers are shown for all species, but only for those countries where greater than 10,000 birds have been ringed.

Species	Belgium	Britain	Germany	Neth.	Spain	Sweden	Switz.	Total
Alpine Swift			5		13		3637	3655
Aquatic Warbler	6	1	4	2	2			15
Arctic Tern		1086	856	186	1	149		2278
Baillon's Crake		1						1
Barred Warbler	2	4	148	1		23		178
Bee-eater			188		38			226
Black Kite	1		266		291	1	457	1016
Black Stork			33		7		3	43
Black Tern	3		48	245	16	25		337
Black-ear Wheatear					3			3
Black-winged Stilt	1			1	71			73
Bluethroat	277	4	465	75	397	201	17	1436
Blyth's Reed Warbler		2				4		6
Bonelli's Warbler			1		41			42
Booted Eagle					60			60
Caspian Tern						2025		2025
Citrine Wagtail		1						1
Collared Flycatcher			96			341		437
Collared Pratincole					4			4
Common Sandpiper	232	215	753	24	113	240	23	1600
Common Tern	77	3212	2926	2773	72	455	139	9654
Corncrake		13	104	30		8		155
Cuckoo	23	98	39	36	5	8	8	217
Egyptian Vulture					42			42
Eleonora's Falcon					5			5
Garden Warbler	851	559	4323	232	312	225	69	6571
Garganey	42	52	24	487		20	5	630
Glossy Ibis					180			180
Golden Oriole	1	9	33	5	15		3	66
Grasshopper Warbler	18	37	232	7	1	15	1	311
Great Reed Warbler	32		1536	58	482	135	62	2305
Great Snipe						3		3
Great Spotted Cuckoo					2			2
Green Sandpiper	49	34	33	9	4	44	3	176
Greenish Warbler						2		2
Greenshank	29	108	31	36	4	32	13	253
Gull-billed Tern					30			30
Hobby	27	42	79	94	3	31	20	296
Honey Buzzard	5	4	57	22	1	80	6	175

Species	Belgium	Britain	Germany	Neth.	Spain	Sweden	Switz.	Total
Hoopoe	2	1	77	1	28		13	122
House Martin	198	1155	2825	71	209	89	90	4637
Icterine Warbler	69	2	653	33	2	51	6	816
Lesser Grey Shrike		1	3					4
Lesser Kestrel					362			362
Lesser Spotted Eagle			11					11
Lesser Whitethroat	61	453	1810	53		221	5	2603
Little Bittern	6		19	4	12		11	52
Little Crake			1					1
Little Ringed Plover	35	81	229	55	59	89	6	554
Little Tern	4	168	663	150	73	59		1117
Manx Shearwater		2438			545			2983
Marsh Sandpiper			3					3
Marsh Warbler	1188	17	3475	104		78	15	4877
Melodious Warbler	1	1			317			319
Montagu's Harrier	2	11	41	19	81	9	1	164
Night Heron	14				26		1	41
Nightingale	48	75	2532	59	1372		31	4117
Nightjar	8	81	78	7	4	14	3	195
Olivaceous Warbler					180			180
Orphean Warbler					16			16
Ortolan Bunting	8		4		59	11	7	89
Osprey		160	1015		3	1419	1	2598
Paddyfield Warbler		1						1
Pallid Swift					31			31
Pied Flycatcher	55	4775	1397	3248	230	1764	154	11623
Purple Heron	1		5	469	44		14	533
Quail	1	2	32	8	307		16	366
Red-backed Shrike	6	6	1114	2	7	191	12	1338
Red-br'st Flycatcher		1	8			4		13
Red-footed Falcon				1		1		2
Red-neck Phalarope	1	1	1			5		8
Red-rump Swallow					10			10
Redstart	178	314	1177	161	34	360	72	2296
Reed Warbler	4275	8050	31300	3090	1912	2680	237	51544
River Warbler		1	104			9		114
Roller			2		7			9
Roseate Tern		423						423
Rose-colour Starling					1			1
Ruff	86	64	111	259	5	410	14	949
Rufous-t Scrub-robin					43			43
Rustic Bunting			2			11		13
Sand Martin	1257	17738	3111	1431	621	581	279	25018

Species	Belgium	Britain	Germany	Neth.	Spain	Sweden	Switz.	Total
Sandwich Tern	31	3705	1207	792	30	721		6486
Savi's Warbler	5	2	1271	12	25		6	1321
Scarlet Rosefinch		3	499	1	1	68		572
Scops Owl					96			96
Sedge Warbler	241	5751	1102	545	62	746	7	8454
Short-toed Eagle					16			16
Short-toed Lark					4			4
Spotted Crake	1	3	48	10		5	9	76
Spotted Flycatcher	80	352	184	60	67	113	19	875
Squacco Heron					12			12
Subalpine Warbler		1		1	37			39
Swallow	3112	9093	1973	1808	1376	310	1003	18675
Swift	65	2814	1615	137	60	190	535	5416
Tawny Pipit			11			8		19
Temminck's Stint	4		6		3	29	2	44
Thrush Nightingale			566			65		631
Tree Pipit	45	28	244	26	2	80	39	464
Turtle Dove	259	158	8	66	36	2	1	530
Wheatear	25	271	202	40	21	54	8	621
Whimbrel	127	43	11	48	4	3		236
Whinchat	13	98	483	14	9	58	33	708
Whiskered Tern					10			10
White Stork	22		22010	764	2269	35	4309	29409
Whitethroat	168	885	1446	55	53	214	15	2836
Willow Warbler	251	2918	2913	735	115	1240	44	8216
Wood Sandpiper	23	2	233	9	4	526	68	865
Wood Warbler	41	36	213	1		36	1	328
Woodchat Shrike			11		70		3	84
Wryneck	8	13	252	11	70	60	15	429
Yellow Wagtail	229	431	1324	25	38	345	28	2420
Grand Total	13930	68109	101915	18708	13305	17031	11599	244597

Table 8. Recoveries of migrant birds held in Africa about which information is held within the EDB. Note the Table is in two parts (countries A-L and countries M-Z).

Species	Angola	Benin	Botswana	C African Rep	Cameroon	Ceuta	Chad	Congo	Dahomey	Egypt	Eq. Guinea	Ethiopia	Gabon	Gambia	Ghana	Guinea	Guinea Bissau	Guinea Is	Ivory Coast	Kenya	Liberia	Libya
Alpine Swift															1							
Arctic Tern	30				9			13	1		3		15	2	44		3		10		20	
Barred Warbler																						
Bee-eater																						
Black Kite		4				1			3	1				2	7	2			9	1		
Black Stork							1			1												
Black Tern									1				1		8				2			
Black-winged Stilt																						
Bluethroat																						
Booted Eagle																						
Caspian Tern		2					1			49		3	1	2	45				2	1	1	23
Collared Flycatcher	1									2												
Collared Pratincole																						
Common Sandpiper		1			1									4	8	1	3		5		1	
Common Tern	77	1			6			72	5		7		58	21	316	19	24	1	92	1	87	
Corncrake								1														
Cuckoo										1												
Egyptian Vulture																						
Eleonora's Falcon																						
Garden Warbler										1					12	2	1		1			1
Garganey										1												1
Glossy Ibis															1							1
Golden Oriole																						1

Species	Angola	Benin	Botswana	C African Rep	Cameroon	Ceuta	Chad	Congo	Dahomey	Egypt	Eq. Guinea	Ethiopia	Gabon	Gambia	Ghana	Guinea	Guinea Bissau	Guinea Is	Ivory Coast	Kenya	Liberia	Libya
Grasshopper Warbler																						
Great Reed Warbler								1	1						2				1			2
Great Snipe																						
Great Spotted Cuckoo																						
Green Sandpiper				1						1												
Greenshank		1													7	1						
Gull-billed Tern																	5					
Hobby										1												
Honey Buzzard				1	4			3		3			1		17	3			2		2	
Hoopoe																						
House Martin					2																	
Icterine Warbler								1							1							1
Lesser Kestrel																						
Lesser Spotted Eagle																						
Lesser Whitethroat							2			34												
Little Bittern																						
Little Crake																						
Little Ringed Plover																						1
Little Tern															1		4					
Manx Shearwater	1														1				1			
Marsh Sandpiper																						
Marsh Warbler										3										10		1
Melodious Warbler																						

Species	Angola	Benin	Botswana	C African Rep	Cameroon	Ceuta	Chad	Congo	Dahomey	Egypt	Eq. Guinea	Ethiopia	Gabon	Gambia	Ghana	Guinea	Guinea Bissau	Guinea Is	Ivory Coast	Kenya	Liberia	Libya
Montagu's Harrier																			1			
Night Heron							2		1	1					1	2						1
Nightingale							1															
Nightjar																						
Olivaceous Warbler																						
Ortolan Bunting																						
Osprey		4		1	2		6	1	3	3			1	20	40	12	10		34		5	7
Pied Flycatcher				1		1								1	1	2					1	1
Purple Heron		1								2					12	1			3		7	3
Quail																						
Red-backed Shrike	1									35												1
Redstart						1	1							1								3
Reed Warbler					1	2	5			18				3	9	3	3		14		2	2
Roller																						2
Roseate Tern														1	192	3	3		31		8	
Ruff							4			1							3		1			2
Sand Martin				3																		4
Sandwich Tern	127	3			1			75	6	1	3		18	31	507	29	37	4	240	1	182	1
Savi's Warbler																						
Scops Owl																			1			
Sedge Warbler							1			12					10				1		1	3
Short-toed Eagle																						
Spotted Flycatcher	1					1		5		4												2
Squacco Heron																1						
Subalpine Warbler																						
Swallow	3		18	39	11	1	1	20	1	1			1		26	4			12	10	9	6

Species	Angola	Benin	Botswana	C African Rep	Cameroon	Ceuta	Chad	Congo	Dahomey	Egypt	Eq. Guinea	Ethiopia	Gabon	Gambia	Ghana	Guinea	Guinea Bissau	Guinea Is	Ivory Coast	Kenya	Liberia	Libya
Swift				3				4														
Tawny Pipit																						
Temminck's Stint																						
Thrush Nightingale										12										3		
Tree Pipit																1					1	
Turtle Dove						1				1												1
Wheatear																						
Whimbrel		1							2						4	5	3		1			
Whinchat															2				1			
White Stork	1		3	2			9	1		74		9		1	5	1			4	30		18
Whitethroat					1		3			21												11
Willow Warbler				1	2	4	2			63					5				8			3
Wood Sandpiper					1				1	2			2		5	1			1		2	
Wood Warbler									2													
Woodchat Shrike																						
Wryneck																						
Yellow Wagtail				2			1			1				1	7	1	3		12			1
Grand Total	242	18	21	54	41	12	40	197	27	350	13	12	98	90	1297	94	102	5	490	57	329	104

Species	Madagascar	Malawi	Mali	Mauritania	Melila	Morocco	Mozambique	Namibia	Niger	Nigeria	Senegal	Sierra Leone	Somalia	Sudan	Tangier	Tanzania	Togo	Tunisia	Uganda	Upper Volta	Zaire	Zambia	Zimbabwe	Total
Alpine Swift						1																		2
Arctic Tern				3		6	2	7		24	10	10					2				2			216
Barred Warbler														1										1
Bee-eater						3												2						5
Black Kite			10	4		66				2	5						3	6						126
Black Stork			2			1																		5
Black Tern						1					2						3							18
Black-winged Stilt				1		7					2							2						12
Bluethroat						5			1		3							1						10
Booted Eagle				1		3																		4
Caspian Tern			303	2		7			7	7	25	5		2		1		72		6	6			573
Collared Flycatcher																		2				1		6
Collared Pratincole						1					1													2
Common Sandpiper			3			32					3	3						2						67
Common Tern		1		30		65	2	146		25	391	90	2			3	28				2			1572
Corncrake																								1

Species	Madagascar	Malawi	Mali	Mauritania	Melila	Morocco	Mozambique	Namibia	Niger	Nigeria	Senegal	Sierra Leone	Somalia	Sudan	Tangier	Tanzania	Togo	Tunisia	Uganda	Upper Volta	Zaire	Zambia	Zimbabwe	Total
Cuckoo						2											1							4
Egyptian Vulture						2																		2
Eleonora's Falcon	1																							1
Garden Warbler			1	3	1	73				1	1	2					1				10	1		112
Garganey			24							1	12									1				40
Glossy Ibis			8								1			1				1						13
Golden Oriole																								1
Grasshopper Warbler				1		2					1													4
Great Reed Warbler				1		1				3								3						15
Great Snipe								1																1
Great Spotted Cuckoo						1																		1
Green Sandpiper						4																		6
Greenshank			4			3				3	1	1												21
Gull-billed Tern											1													6
Hobby						2																		3
Honey Buzzard			1			5			1	6							2	2			1			54
Hoopoe						7																		7
House						12				1	1							5			1		3	25

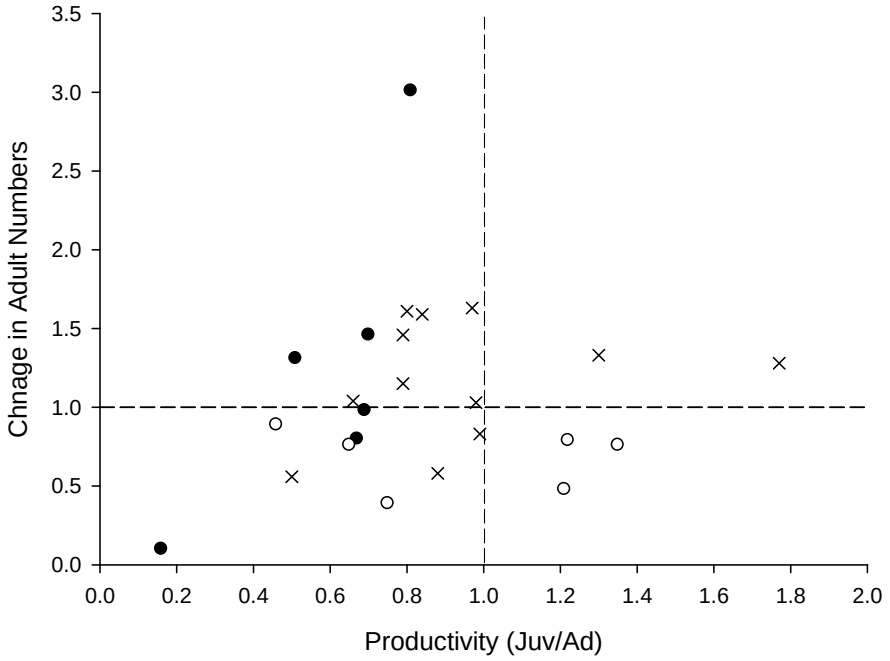
Species	Madagascar	Malawi	Mali	Mauritania	Melila	Morocco	Mozambique	Namibia	Niger	Nigeria	Senegal	Sierra Leone	Somalia	Sudan	Tangier	Tanzania	Togo	Tunisia	Uganda	Upper Volta	Zaire	Zambia	Zimbabwe	Total
Martin																								
Icterine								1										1			1			6
Warbler																								
Lesser						2		1										2						5
Kestrel																								
Lesser																								
Spotted														1										1
Eagle																								
Lesser																								36
Whitethroat																								
Little Bittern									1															1
Little Crake									1															1
Little																								
Ringed			1			2					1			1			1	3		1				11
Plover																								
Little Tern				1		7					12													25
Manx						3																		6
Shearwater																								
Marsh											1													1
Sandpiper																								
Marsh				2		1								1				1						19
Warbler																								
Melodious						2																		2
Warbler																								
Montagu’s						6					4			1										12
Harrier																								
Night Heron			6			4			1		1	1						1						22
Nightingale					1	27												1						30
Nightjar						1																1		2
Olivaceous						21			1									1						23
Warbler																								

Species	Madagascar	Malawi	Mali	Mauritania	Melila	Morocco	Mozambique	Namibia	Niger	Nigeria	Senegal	Sierra Leone	Somalia	Sudan	Tangier	Tanzania	Togo	Tunisia	Uganda	Upper Volta	Zaire	Zambia	Zimbabwe	Total
Ortolan Bunting						2												1						3
Osprey			66	8		30			7	25	69	12		1			3	3		7		1	1	382
Pied Flycatcher					2	451				1		1						21						484
Purple Heron			17		1	30				1	3	7						5						93
Quail						3					1							1						5
Red-backed Shrike		2												3		4			1		5	4		56
Redstart				1	2	203					1							24						237
Reed Warbler		1	21	32		327			7	4	142				1			1		2				600
Roller																								2
Roseate Tern						12				4	22	10					11							297
Ruff			91	5		10				1	46			3				4						171
Sand Martin			4	2		52					472							21			7			565
Sandwich Tern				49	2	63	1	37		27	789	192					8				3			2437
Savi's Warbler			1			3					1													5
Scops Owl						1																		2
Sedge Warbler			19	2		43			52	1	86	1						2		2	2	1		239
Short-toed Eagle			1			1																		2
Spotted Flycatcher				1		22				5								5			27			73
Squacco Heron												1												2

Species	Madagascar	Malawi	Mali	Mauritania	Melila	Morocco	Mozambique	Namibia	Niger	Nigeria	Senegal	Sierra Leone	Somalia	Sudan	Tangier	Tanzania	Togo	Tunisia	Uganda	Upper Volta	Zaire	Zambia	Zimbabwe	Total
Subalpine Warbler						12			2		2													16
Swallow			3	10	2	220	2	11	1	95	4						1	45	3		70	7	6	643
Swift		13				42	1											4			18	1		86
Tawny Pipit						1																		1
Temminck's Stint						2												1						3
Thrush Nightingale																								15
Tree Pipit				1		6												5						14
Turtle Dove			6	1	1	23					5							3						42
Wheatear					1	106												5						112
Whimbrel						5				2	2	5												30
Whinchat					2	29												4						38
White Stork		4	127	30		361	3		5	17	6			59		37		5	4		5	9	57	887
Whitethroat						20			54		5			1				3		1				120
Willow Warbler			4	3	1	81			4	1	3	1		1		1	1	6	3	2	20	4	4	228
Wood Sandpiper			14			4			2	1	11						2	4			3	2		58
Wood Warbler						3			1															6
Woodchat Shrike						13												4						17
Wryneck						2																		2
Yellow Wagtail			5	4	1	104			11	9	20	2		1			1	4		2	1			194
Grand Total	1	21	742	198	17	2675	11	204	159	267	2169	344	2	77	1	46	68	289	11	24	184	32	71	11306

Figure 1. Change in population index in relation to change in productivity for species monitored on CE sites for two time periods (a) 1984-2003 and (b) 1993-2003. Crosses – residents; filled circles – short-distance migrants; open circles – long-distance migrants.

(a)



(b)

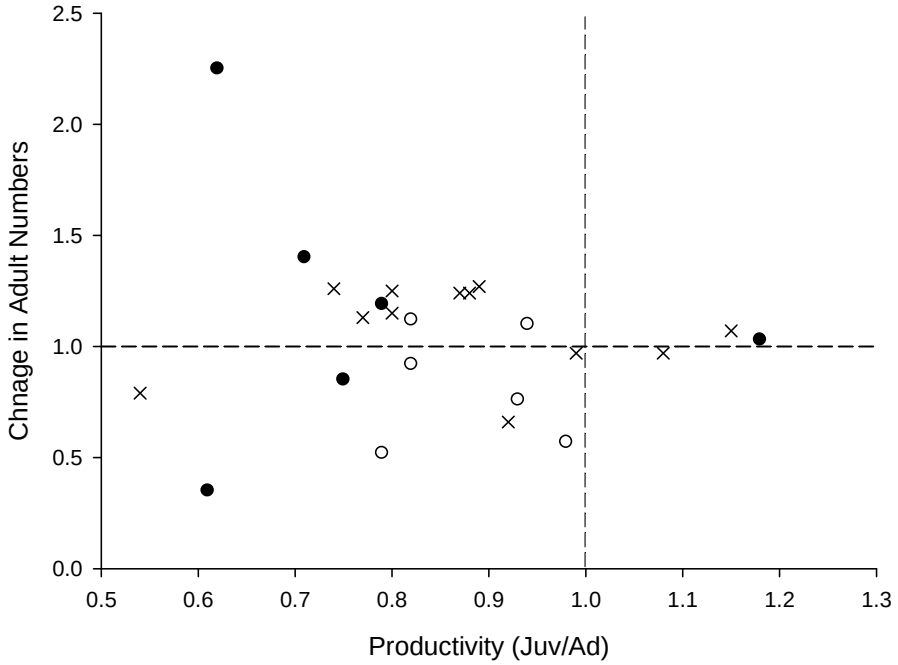


Figure 2. Productivity indices for Blackcap on CES sites in Britain (solid line) and France (dashed line) for the period 1990-2000.

Figure 3. Annual adult survival rates in three species of hirundine from RAS studies (Robinson *et al.* MS in prep.).

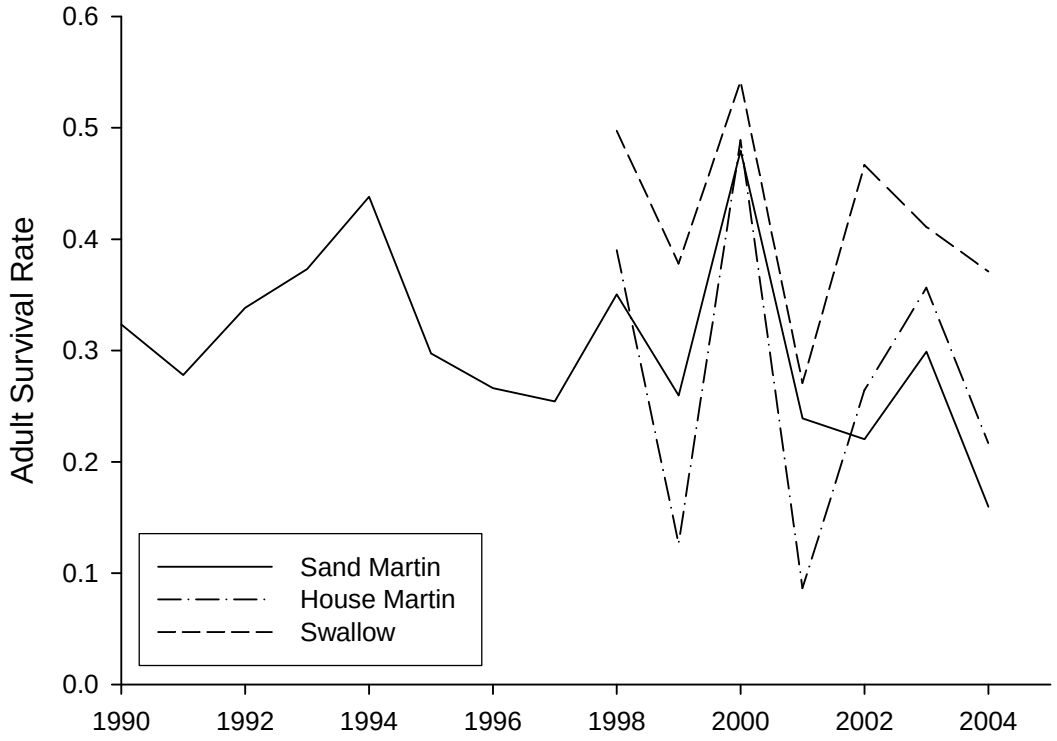
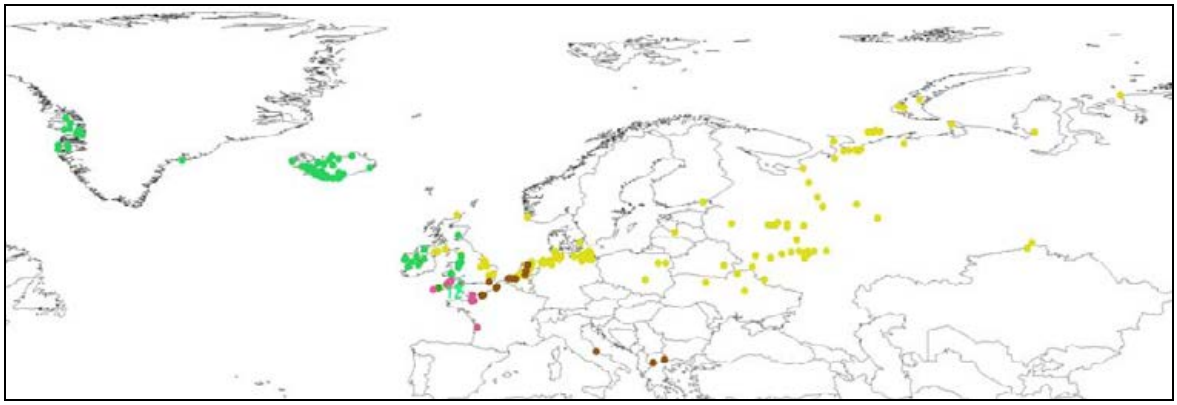


Figure 4. Movements of British White-fronted Goose populations, GAMs are used to identify different population movements (a) identified by different colour dots; and then to show the seasonal timing of movements (b) for the Siberian breeding population. Each dot on the map represents a movement of one bird in Britain to or from the indicated location.

(a)



(b)