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The migration seasons of birds as recorded at Dungeness Bird Observatory in southeast England

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This paper summarises the migration periods of birds at Dungeness Bird Observatory, Kent, southeast England, as calculated from daily counts conducted over an 18-year period. Mean spring migration dates for different species ranged between 6 February (Greenfinch *Carduelis chloris*) and 26 May (Reed Warbler *Acrocephalus scirpaceus*), and mean late summer/autumn dates between 11 August (Reed Warbler) and 27 November (Great Crested Grebe *Podiceps cristatus*). In general, species which arrived early in spring tended to depart late in autumn and vice versa. The overall average spring passage date for all species was 9 April and the overall autumn date 3 October. Long-distance migrants, wintering in sub-Saharan Africa, tended to arrive later and depart earlier, spending a shorter period in Britain than short-distance migrants wintering within Europe. Although the population levels of birds are higher in autumn than in spring, in some species the spring totals at Dungeness far exceeded their autumn totals. The annual cycles of the birds passing through Dungeness, as reflected in their migration dates, were centred not on the longest day, nor on the warmest, but roughly midway between the two.

Most recent interest in the migration dates of birds has been generated by concern over the impacts of climate change, and little attention has been paid to other aspects of migration dates. Our aim in this paper is to examine the migration seasons of various bird species that passed through Dungeness Bird Observatory (50.9°N, 1.0°E) during 1990–2007. Situated on the southeast corner of England, this Observatory is ideally sited to record the movements of birds in and out of Britain, as well as those passing through the English Channel. Moreover, the Observatory is permanently manned, and systematic records have been kept of all the birds recorded there on a daily basis over many years. Some of the findings are known in general terms but, to our knowledge, have not been quantified or examined in detail. Because the total study period is relatively short (16–18 years, depending on species), we will forgo in this paper discussion of any changes in migration dates that may have occurred within this period. Nevertheless, bear in mind that this study period included some of the warmest years on record for southeast England.

Several previous studies gave quantitative information on the seasonal occurrence of birds at British and Irish observation sites, including Cape Clear (Sharrock 1973), Lundy Island (Dymond 1980), Bardsey Island (Roberts 1985), Calf of Man (Cullen & Jennings 1986), Fair Isle (Dymond 1991) and North Ronaldsay (reported in Forrester & Andrews 2007). Other studies gave details from one or more Bird Observatories for particular groups of species (*eg* see Davis 1967 for *Sylvia* warblers at seven British Bird Observatories, Riddiford & Findley 1981 for 39 summer-visiting species at nine Observatories), or for individual species (for Common Redstart[1] see Hope Jones 1975; for Ring Ouzel see Durman 1976; for Pied Flycatcher see Hope Jones *et al* 1977; for Black Redstart see Langslow 1977; for Reed and Sedge Warblers see Insley & Boswell 1978; for Blackcap see Langslow 1979). However, in none of these studies was any comparative statistical analysis made of the data presented. Similar information on seasonal occurrence is available for a number of Bird Observatories in continental Europe, as may be seen from their respective web sites.

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[1] Scientific names are given in Appendix 1 or, for species not listed in Appendix 1, at first mention in the text

METHODS

We used the daily totals of all the birds counted at Dungeness Bird Observatory during the 18 years 1990–2007. More than eight million birds were recorded in this period. However, in the first two years, some species were noted as present only, with no numbers given, so for these species only data for the years 1992–2007 were included. Each morning during the study period, weather permitting, all birds were counted within an approximate 2-km^2 area, which included willow scrub, open shingle with patches of broom and gorse, and two gravel pits edged with additional willow scrub. The numbers counted on any particular day were a function of the numbers of new arrivals and the numbers remaining from previous days, which in migration seasons could not normally be distinguished. The count area did not change substantially during the study period, except that some of the bushes became larger (for more detailed description of the general area see Scott *et al* 1976). Throughout the period from March to October/November, 'daily' counts were made by the Warden and Assistant Warden, and these counts formed the basis for assessing the daily totals of each species present. During the winter months, only one person (the Warden) was there to make the counts, but far fewer birds were present then. The numbers of additional observers present at the Bird Observatory fluctuated greatly during the year, but their records, along with ringing results, were taken into account in assessing the daily totals of each species judged to have been present, and entered into the Observatory logbooks. It is the view of the Observatory Warden (DW) that fluctuations in observer numbers would not have influenced the recorded passage periods of different species, as documented here. The sea-watch counts refer to all observations of passing seabirds made during specified watch periods (using telescopes), and for some purposes (see below) these counts were expressed on a 'birds per hour' basis.

To assess the overall seasonal pattern in numbers of each species, the data for all 16–18 years were combined, and expressed as the average number of individuals seen per day in each five-day period (pentad). Only the 154 species recorded in at least 10 of the 18 years and averaging at least 10 birds in any one season were included in further analyses. Seven main patterns emerged:

1. Birds present mainly or entirely in the spring and/or autumn migration seasons, with only occasional or no individuals recorded between these seasons, in summer and winter; a pattern shown by passage migrants to the area. Fifty-two species showed this type of pattern (Appendix 1), exemplified by the Spotted Flycatcher in Fig 1a.
2. Birds present mainly during the migration seasons and in smaller numbers in summer, but absent in winter; a pattern with clearly defined migration seasons shown mainly by summer visitors to the area and beyond. Sixteen species showed this pattern (Appendix 1), exemplified by the Northern Wheatear in Fig 1b.
3. Birds present mainly during the migration seasons and in smaller numbers in winter, but entirely or largely absent in summer; a pattern with clearly defined migration seasons shown by winter visitors to the area and beyond. Thirty-eight species showed this pattern (Appendix 1), exemplified by the Redwing in Fig 1c.
4. Birds present year-round, but with clearly defined autumn and/or spring peaks during migration seasons. Twenty-six species showed this pattern (Appendix 1), exemplified by the Robin in Fig 1d.
5. Birds present in summer only, but with no clearly defined peaks during migration seasons. Six species showed this pattern (Appendix 1), exemplified by the Swift in Fig 1e.
6. Birds present in winter only, but with no clearly defined peaks during migration seasons. Eight species showed this pattern (Appendix 1), exemplified by the Red-throated Diver in Fig 1f.
7. Birds present year-round, but with no clearly defined migration seasons. Eight species showed this pattern (Appendix 1), exemplified by the Gannet in Fig 1g.

Only for the 132 species in the first four categories could one or both migration seasons be discerned from the counts. For the 52 species present only in migration seasons, such as the Spotted Flycatcher, these seasons could be clearly and unequivocally defined, enabling calculation of first, last, mean and peak dates for each year (Fig 1a). The remaining species were also present at times outside the migration seasons, making it hard to delimit these seasons precisely. We therefore adopted an arbitrary procedure for all species in categories 1–4, counting the first half of the year (1 January–30 June) as 'spring' and the second half of the year (1 July–31 December) as 'autumn'. Peak migration dates for each species were then taken as the particular five-day period (pentad) when peak counts were recorded in each half of the year. This was done separately for each year, and standard deviations for each season were also estimated for each year and averaged (Appendix 1). Mean dates were calculated from the daily counts in each half of the year, and standard deviations of the overall means were again estimated from the separate means for individual years. Although, for most species, some daily counts would have fallen outside the migration seasons (referring to summer or winter residents), these counts usually involved relatively small numbers of individuals (note the log scale in Fig 1), and the overall mean dates for different species were highly correlated with the overall peak pentad dates (spring: $r = 0.912$; autumn: $r = 0.880$; both $P < 0.001$). In view of these

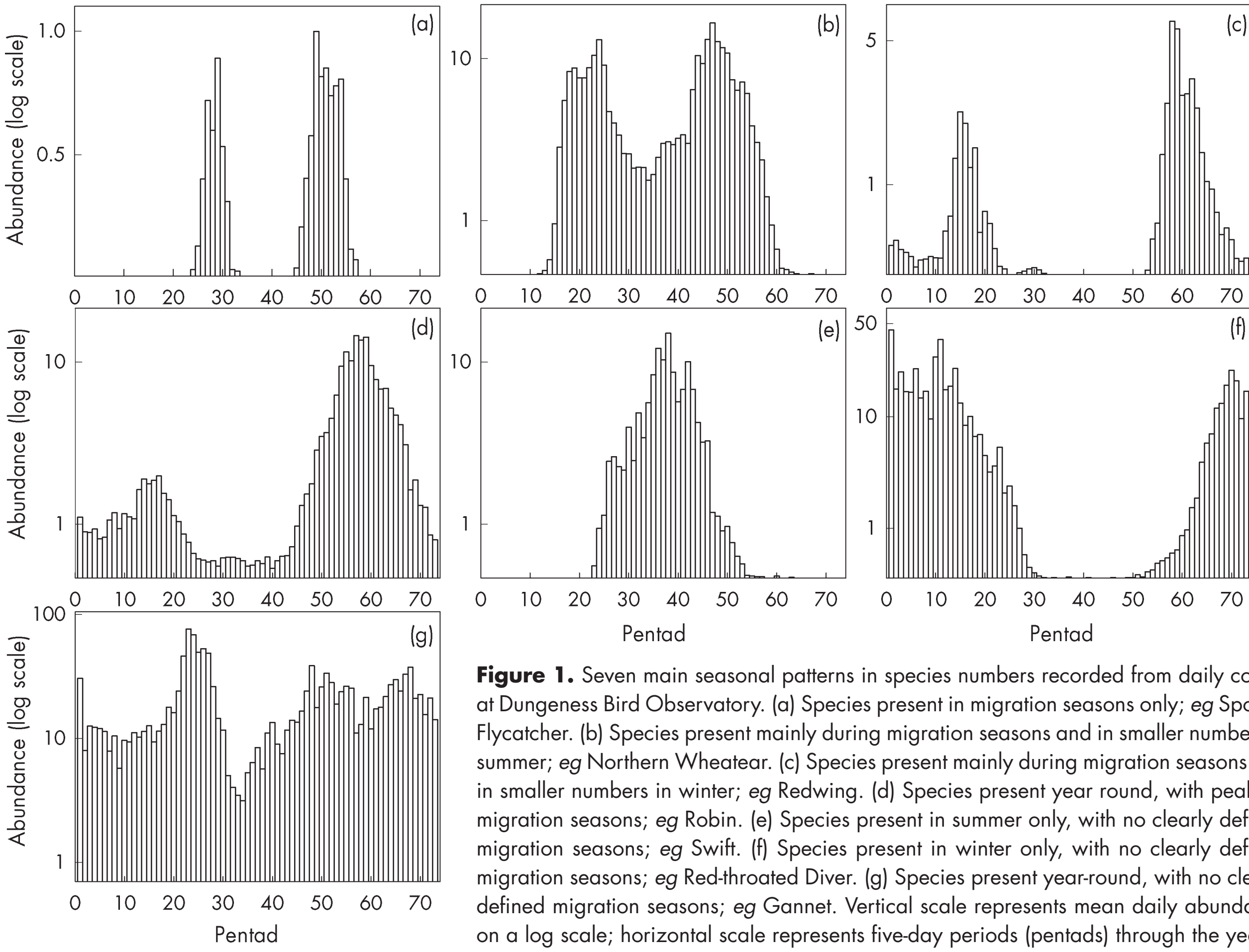

Figure 1. Seven main seasonal patterns in species numbers recorded from daily counts at Dungeness Bird Observatory. (a) Species present in migration seasons only; *eg* Spotted Flycatcher. (b) Species present mainly during migration seasons and in smaller numbers in summer; *eg* Northern Wheatear. (c) Species present mainly during migration seasons and in smaller numbers in winter; *eg* Redwing. (d) Species present year round, with peaks in migration seasons; *eg* Robin. (e) Species present in summer only, with no clearly defined migration seasons; *eg* Swift. (f) Species present in winter only, with no clearly defined migration seasons; *eg* Red-throated Diver. (g) Species present year-round, with no clearly defined migration seasons; *eg* Gannet. Vertical scale represents mean daily abundance on a log scale; horizontal scale represents five-day periods (pentads) through the year.

high correlations, most of the remaining analyses were conducted on mean dates alone.

For the remaining species (categories 5–7), mean and peak migration dates could not be calculated, but first or last spring and/or autumn dates could be calculated for all species present during only part of the year, whether summer or winter visitors or passage migrants. These dates are given in Appendix 1 for whichever species they could be calculated. Only for the eight species that were present year-round, with no clearly defined seasonal peaks, such as the Gannet, could no useful information on migration seasons be calculated, and these species are excluded from further consideration.

A record of time spent on sea-watch hours had also been kept. For seabirds only, we recalculated the above statistics based on the mean number of individuals of each species observed passing by per sea-watch hour (Appendix 2). For most species totals were much smaller than in the overall data (which included resting and feeding birds), and for seven species migration peaks that were clearly evident in the overall data were not apparent in the sea-watch data. These seven species were therefore re-allocated to different groups in Appendix 2, and no migration peaks from sea-watch data were calculated: they were Northern Fulmar, Great Cormorant, European Shag, Glaucous Gull, Common Tern, Scaup and Common Goldeneye. For other seabird species, mean migration dates calculated from sea-watch data differed slightly from those calculated from the overall data. Our purpose in Appendix 2 is to present these sea-watch data in a way that they can be compared with similar data collected elsewhere (*eg* Cooke 2006), and unless stated otherwise, the remaining text is based on the overall data in Appendix 1.

RESULTS

General patterns

The overall average spring migration date of all species was 9 April (day 99 from 1 January), and the overall autumn date 3 October (day 276) (Fig 2). However, great variation was apparent in the migration dates of different species,

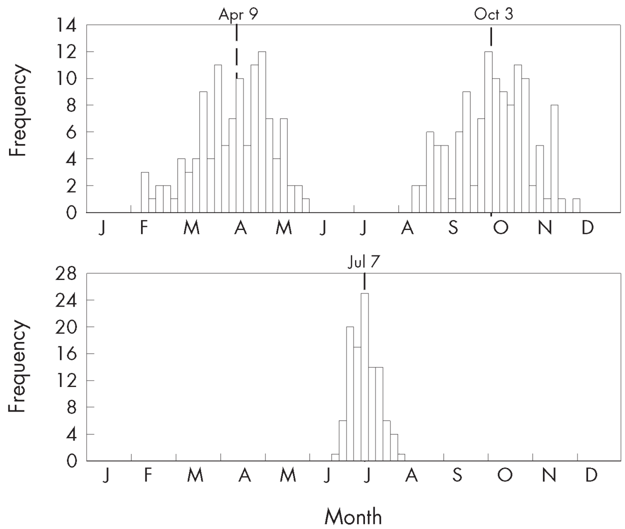

Figure 2. Distribution of species mean spring and autumn migration dates (upper), and the distribution of mid dates (bisectrix) between their mean spring and autumn migration dates (lower). Histograms are based on five-day intervals (pentads), with initial letter of months marking the approximate midpoint of each month. Overall mean dates are indicated by vertical dashed lines. Based on the 132 species for which mean autumn and/or spring migration dates could be calculated.

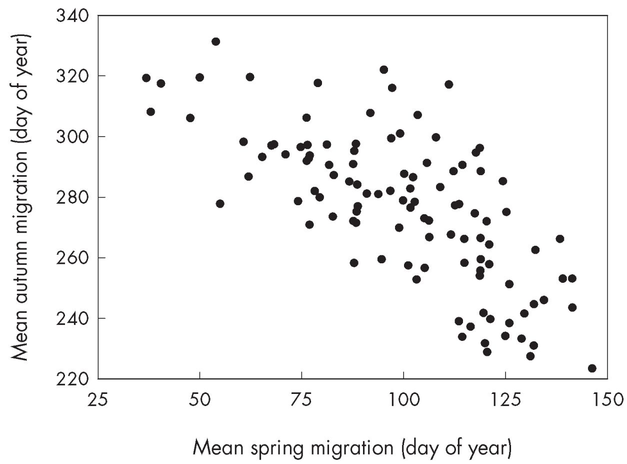

Figure 3. Relationship between mean spring and autumn migration dates for species recorded in both seasons. In general, species that passed through early in spring tended also to pass through late in autumn, and vice versa (r = -0.713, *P* < 0.001).

with mean spring dates ranging between 6 February (day 37, Greenfinch) and 26 May (day 146, Reed Warbler), and mean autumn dates between 11 August (day 223, Reed Warbler) and 27 November (day 331, Great Crested Grebe). There was a broad correlation between spring and autumn dates: species which passed through Dungeness late in spring tended also to pass early in autumn, while species which passed through early in spring tended to pass late in autumn (r = -0.713, *P* < 0.001, Fig 3).

Other patterns were apparent across species. For example, the first spring date was correlated with the mean spring date (r = 0.719, *P* < 0.001, Fig 4), and the last autumn date was correlated with the mean autumn date (r = 0.703, *P* < 0.001, Fig 5). Furthermore, the standard deviation of mean spring date was correlated with the mean spring date (r = -0.468, *P* < 0.001, Fig 6), reflecting greater variation in the inter-annual arrival dates of early spring migrants than later ones. In contrast, the standard deviation of the mean autumn dates of different species was not significantly correlated with their mean autumn dates (r = 0.158, *P* = 0.081). However, the standard deviation of the mean spring date was correlated with the standard deviation of the mean autumn date (r = 0.377, *P* < 0.001).

In general, the arrival and departure dates of migrants at Dungeness reflected some well-known patterns among closely related species hitherto studied mainly by first arrival dates. For example, the three hirundine species arrived (mean dates) in spring in order Sand Martin (day 126), Barn Swallow (day 132) and House Martin (day 138), and left in the same order (days 238, 262 and 266 respectively). In the last respect, they differed from the general trend among all species. Similarly, eight different warblers in the genera *Phylloscopus*, *Sylvia* and *Acrocephalus* arrived (mean dates) in the sequence: Chiffchaff (day 102), Willow Warbler (114), Blackcap (118), Sedge Warbler (129), Whitethroat (131), Garden Warbler (132), Lesser Whitethroat (134) and Reed Warbler (146). They left in the order Reed Warbler (223), Whitethroat (227), Sedge Warbler (233), Willow Warbler (234), Garden Warbler (245), Lesser Whitethroat (246), Blackcap (274) and Chiffchaff (276). Compared with the hirundines, these warbler species more closely approximated the overall pattern among all species, with the earliest to arrive being last to leave.

Reflecting another well-known pattern, long-distance migrants, wintering in sub-Saharan Africa, tended to arrive later and depart earlier, spending a shorter period in Britain than short-distance migrants that winter within Europe. This pattern is shown for passerines in Fig 7, but it also occurs in some other groups (Appendix 1). Most large bird species raise only one brood per year in Britain, but among passerines, almost every species would have time to raise more than one brood (or at least attempt a repeat nest if the first failed).

Annual cycle in relation to seasonal daylength and temperature changes

Following Preston (1966), we calculated the midpoints (bisectrix dates) between mean autumn and spring migration dates of 108 bird species for which these dates could be reliably obtained. The average mid date for all

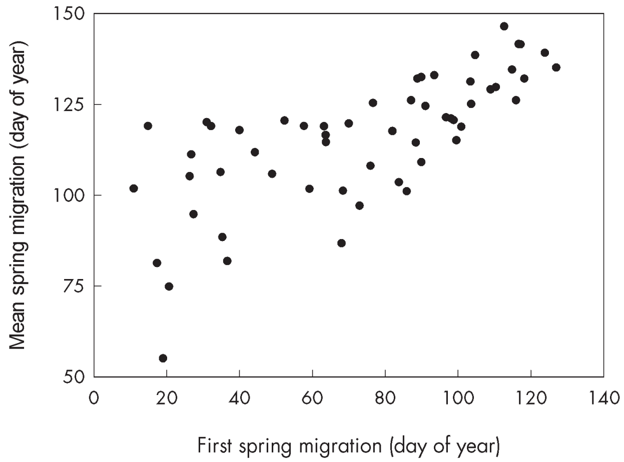

Figure 4. Relationship between the first spring date and the mean spring date for 51 species in which both dates could be calculated (r = 0.719, *P* < 0.001).

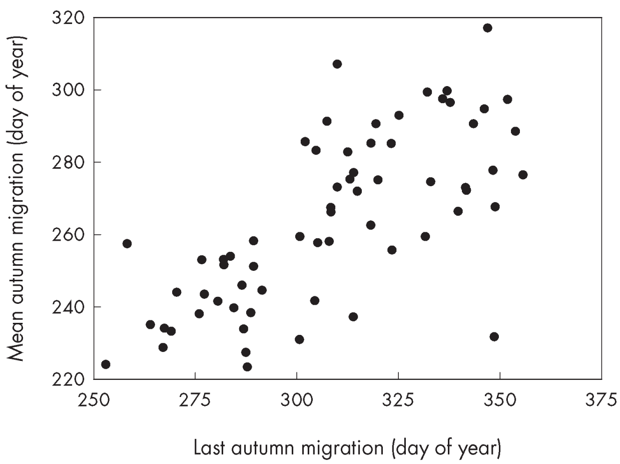

Figure 5. Relationship between last autumn date and mean autumn date for 59 species in which both dates could be calculated (r = 0.703, *P* < 0.001).

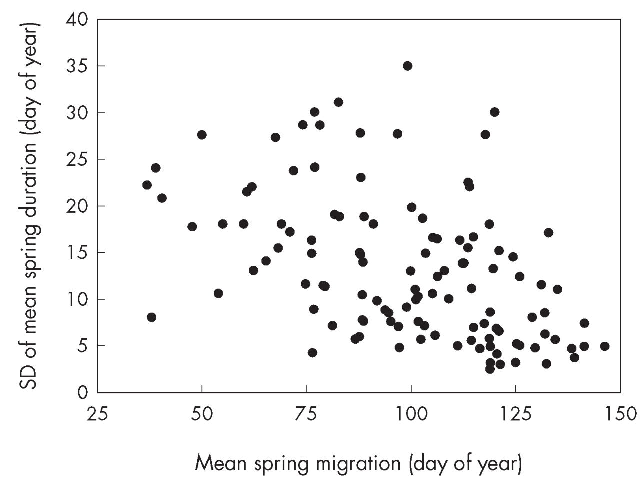

Figure 6. Relationship between the standard deviation of mean spring migration date and the mean spring migration date across species (r = -0.468, *P* < 0.001).

species combined fell on 7 July (day 188). These mid dates varied considerably between species (day 166–214), but all except one fell after the summer solstice. The bisectrix dates at Dungeness are shown in Fig 8 in relation to the seasonal changes in daylength (taken at London, *c*.50 km further north than Dungeness) and temperature (Central England series) recorded over the same period. As in the rest of the northern hemisphere, the longest day fell on 21 June (at London 16.6 hours), and the shortest on 21 December (at London 7.8 hours). The annual temperature cycle lagged more than a month behind the daylight cycle, with the hottest pentad falling, on average, in early August, and the coldest, on average, in late January. It is clear from Fig 7 that the annual cycles of the birds passing through Dungeness, as reflected in their migration dates, were centred not on the longest day nor on the warmest but about midway between.

In calculating the difference between mean spring and mean autumn passage dates, considerable variation was apparent between categories 1–4 in Appendix 1 (one-way ANOVA of difference on group category; $F_{3,\ 104}$= 32.72, $P < 0.001$, all significantly different from one another using a Tukey multiple comparison). Passage migrants at Dungeness (category 1) showed a mean difference of 159 days (n = 35), summer visitors (category 2) of 123 days (n = 15), winter visitors (category 3) of 190 days (n = 34), residents/passage migrants (category 4) of 225 days (n = 21). For none of these categories were these periods likely to entirely reflect residence periods within Britain, because some individuals seen at Dungeness could have been on passage between breeding and wintering areas beyond Britain. The interval between mean spring and mean autumn peak dates for particular species varied between 77 days (Reed Warbler) and 282 days (Greenfinch).

Autumn and spring totals

All species would be expected to have larger populations in autumn than in spring, as a result of summer breeding, and in most species counted at Dungeness the autumn count was indeed higher than the spring one. However, some species showed larger spring counts than autumn ones (Appendix 1). Species in which spring counts were more than twice as high as autumn counts included (in order of disparity): Bar-tailed Godwit (spring count 25.0× higher than autumn count), Garganey (15.0×), Whimbrel (13.9×), Glaucous Gull (10.0×), Jay (9.5×), Pomarine Skua (8.8×), Greylag Goose (8.5×), Shoveler (8.0×), Little Tern (7.1×), Razorbill (6.1×), Black-throated Diver (4.9×), Fulmar (4.8×), Common Scoter (4.5×), Scaup (4.5×), Brent Goose (3.7×), Great Crested Grebe (3.6×), Tufted Duck (3.6×), Velvet Scoter (3.4×), Red-breasted Merganser (3.1×), Eider (3.0×), Sanderling (2.6×), Knot (2.6×), Shag (2.4×), Oystercatcher (2.4×), Grey Plover (2.2×), Pintail

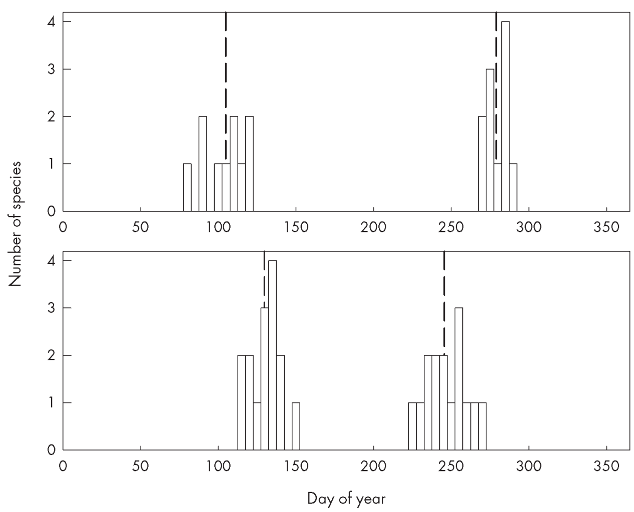

Figure 7. Mean spring and autumn migration dates of various passerines at Dungeness shown separately for 11 short-distance migrants wintering within Europe (upper) and 15 long-distance migrants wintering in Africa south of the Sahara (lower). The mean spring and autumn dates for short-distance migrants were days 102 and 277 respectively, and for long-distance migrants days 128 and 245. Spring and autumn mean dates differed significantly between short-distance and long-distance migrants (spring: $F_{1, 23} = 33.82$, $P < 0.001$; autumn: $F_{1, 24} = 57.98$, $P < 0.001$). Histograms are based on five-day intervals (pentads), and overall means indicated by vertical dashed lines. Short-distance migrants included Skylark, Meadow Pipit, Grey Wagtail (autumn only), Pied/White Wagtail, Black Redstart, Stonechat, Ring Ouzel, Blackcap, Chiffchaff, Goldfinch and Linnet. Long-distance migrants included Sand Martin, Barn Swallow, House Martin, Tree Pipit, Yellow Wagtail, Common Redstart, Whinchat, Wheatear, Sedge Warbler, Reed Warbler, Lesser Whitethroat, Common Whitethroat, Garden Warbler, Willow Warbler and Spotted Flycatcher.

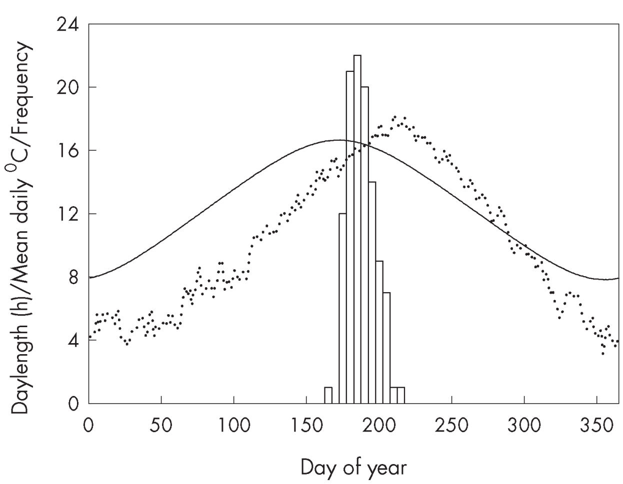

Figure 8. Daylength (hours) for London (solid line), mean daily Central England temperature 1990–2007 (°C, dotted line) and distribution of mid dates between spring and autumn mean migration dates for 108 species at Dungeness.

(2.1×), and Redshank (2.1×). All these species were water-birds or waders which presumably had mainly different routes or stopover behaviour in the two seasons. None of these species is likely to have been more detectable in spring than in autumn, so that the difference in counts reflected a genuine difference in seasonal occurrence. Some other species, generally considered as resident in Britain, also had noticeably higher peaks in spring than in autumn, a difference to which seasonal detectability may have contributed (Corn Bunting 12.1×, Red-legged Partridge 2.1×).

Some seabird species were virtually restricted to one time of year. Thus, Balearic Shearwaters were seen almost entirely in the period mid July to mid September, Sooty Shearwaters in the period August to November, Little Auks mainly in November, and Yellow-legged Gulls in the second half of the year (peaking in early August). Fulmars showed a unique pattern, in being largely absent for a post-breeding period from mid September to mid November, a pattern which was repeated at another sea-watch site on the Norfolk coast, and corresponded to the time when breeding colonies were deserted (Cooke 2006).

DISCUSSION

The advantage of the Dungeness data is that counts of both land-birds and seabirds were available year-round over a long period of years, rather than merely at recognised migration seasons. The position of this Observatory on the coast of southeast England meant that all migratory species breeding or wintering in Britain were likely to occur there, but so were conspecifics travelling to breeding areas further north or to wintering areas further south. It was therefore not possible to separate populations from different parts of Europe, and recorded migration dates are likely to have included breeders from a wider spread of latitude than Britain alone, which in turn is likely to have lengthened the migration seasons beyond those of British birds alone. Moreover, some of the individuals associated with breeding areas within Britain, but which do not breed at Dungeness, still passed through Dungeness (such as Spotted Flycatcher and Arctic Skua).

The midpoints between the mean spring and autumn migration periods of different species were clustered not around the longest day (21 June), nor around the warmest day (early August), but roughly midway between the two. This was not surprising if both daylength and temperature were the main factors influencing vegetation growth and bird food supplies. In general, species which arrived at Dungeness early in spring departed relatively late in autumn, and vice versa, but exceptions occurred. No species could arrive before its particular food became available in spring, nor stay on longer than its food remained available in autumn. In fact, the presence of different summer-visiting species in Britain may have more or less coincided with the periods that their foods were most available here. Thus seed-eaters tended to arrive earlier and depart later than insectivores, and among the latter, hirundines feeding on aerial insects arrived earlier and departed later than the majority of warblers which depended on insects from developing leaves. However, it was also apparent that those species which wintered in sub-Saharan Africa arrived later and left earlier than those that wintered within Europe. Further work is needed to separate the roles of diet and migration distance in influencing the migration and residence periods of different migratory species in Britain, for almost certainly diet influences both wintering area and migration dates (Newton 2008).

The most accurate migration dates recorded here are likely to have derived from passage migrants: the 52 species that were seen at Dungeness only at migration times. The estimated mean migration dates for the remaining species were calculated as half-yearly means, so may have been affected to varying degrees by the numbers of birds seen outside migration seasons. Their effect is likely to have been trivial, however, because their numbers were very small compared to those counted within migration seasons. We judged this procedure the best for calculating mean migration dates from such count data, considering that the alternative would have entailed making separate subjective decisions on migration periods for each species.

The arrival and departure periods of land-bird migrants in Britain are well known to bird-watchers from their own observations, but the emphasis has generally been on first arrival and last departure dates because these are easiest to record (Lehikoinen *et al* 2004). Bird Observatory records provide some of the best available data on the seasonal patterns of migration from which mean or median dates and measures of spread can be calculated (Newton 2008). In future, the BirdTrack programme of the British Trust for Ornithology is likely to provide similar data for the whole of Britain, enabling the movements of different species through the country to be tracked each year (Baillie *et al* 2006). This should represent an improvement on site-specific data of the type we have analysed here.

Although the migration periods of land-bird migrants could be considered relatively well known, with records extending back many years, this is less true for seabirds, because systematic sea-watching is less common. As far as we are aware, the data presented here are the most extensive yet published for seabirds around Britain. Nevertheless, the patterns recorded at Dungeness seem broadly similar to those recorded elsewhere in southeast England. This is evident, for example, in the recent records from Holme Bird Observatory on the North Norfolk coast (Cooke 2006), although not all species were well represented at both sites. As such records are assembled and analysed, it should become possible to build up a more complete picture of offshore seabird movements around Britain and Ireland.

Some of the bird-species that are generally regarded as resident within Britain were recorded as migrants at Dungeness. There were several reasons for this. First, some of the species that are resident in Britain appear at Dungeness as passage migrants or winter visitors from the continent. For some species this was evident not only from observations, but also from the plumage of trapped individuals. For example, almost all the Coal Tits trapped at Dungeness were of the continental race *Periparus a. ater*, rather than of the British race *P. a. britannicus*. Second, it is likely that many of the species regarded as resident in Britain are in fact partial migrants, with a small proportion of the British population undertaking regular migratory movements, as yet unsupported by ring recoveries. This may well account for the spring and autumn peaks at Dungeness of species such as Tree Sparrow and House Sparrow. Yet other species, such as Hobby and Tree Pipit, were recorded at Dungeness only as migrants even though they were nesting a few kilometres inland, there being little or no suitable habitat around Dungeness itself.

To our knowledge, no other study of migration seasons, as recorded at British Bird Observatories, has presented a comparative quantitative analysis of the data similar to ours. The main aim was to elucidate the patterns in migration dates across species at a particular well-studied site, and not to examine either geographical or temporal trends in migration dates. Nevertheless, previous published information indicate species-specific dates roughly similar to ours, but varying according to location and year, and with the spring arrival dates of many species having become earlier in recent years (Lehikoinen *et al* 2004). The earlier studies of migration dates recorded at British and Irish Bird Observatories, mentioned above, presented the data as histograms, showing the totals in five-day or 10-day periods through the year (or through most of the year), without giving means or standard deviations of seasonal peaks. Together with the difficulty of reading individual values from histogram axes, especially when plotted on a logarithmic scale, this makes it impossible to make meaningful comparisons with our data. In any case, assessing phenological time trends was not one of our aims, but it was evident that the status of several species at Dungeness has changed to some degree since 1974–78, the period considered by Riddiford & Findley (1981). For example, several species which were regular as migrants in 1974–78, such as Wryneck *Jynx torquilla*, Grasshopper

Warbler *Locustella naevia*, Wood Warbler *Phylloscopus sibilatrix* and Red-backed Shrike *Lanius collurio*, hardly occurred at all during 1990–2007, while the Black Redstart and Firecrest, seen only at migration times during 1974–78, were seen frequently in some summers and some winters respectively during 1990–2007, though no more than a few individuals at a time. Yet other species, such as Whinchat and Turtle Dove, were generally more abundant during 1974–78 than in 1990–2007, while others were much more often seen in summer during 1974–78 than in 1990–2007. These changes at Dungeness accord with known changes in the status of these species in Britain over the period concerned (www.bto.org/birdtrends/). The information collected over the decades at British Bird Observatories comprises some of the longest-running data sets available on the timing of bird migration, and would surely repay more detailed study.

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Appendix 1. A summary of the seven groups of birds at Dungeness Bird Observatory 1990–2007. Species within groups are arranged in taxonomic order.

Key to columns
A: No. of spring/autumn years of data (if not 18/18).
Species marked by an asterisk are based on years 1992–2007 (see text for details)
B: Mean number of birds recorded per year in spring
C: Mean first spring date (day of year)
D: SD of previous column
E: Mean average spring date (day of year)
F: SD of previous column
G: Mean spring peak pentad
H: Mean within-spring SD (pentads)
I: Mean last spring date (day of year)
J: SD of previous column
K: Mean number of birds recorded per year in autumn
L: Mean first autumn date (day of year)
M: SD of previous column
N: Mean average autumn date (day of year)
O: SD of previous column
P: Mean autumn peak pentad
Q: Mean within-autumn SD (pentads)
R: Mean last autumn date (day of year)
S: SD of previous column
T: Difference (days) between spring and autumn mean dates

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1. Spring and/or autumn migration peaks, few or no winter or summer birds																				
GREYLAG GOOSE *Anser anser*	18/13	212	49	22	106	6	18.5	4.8	154	15	25	268	46	291	30	52.9	3.1	307	38	185
CANADA GOOSE *Branta canadensis*	18/14	41	68	18	101	10	21.0	3.8	139	21	30	256	22	257	22	48.6	0.2	258	21	156
GADWALL *Anas strepera*		71	35	28	88	10	16.8	4.9	133	16	64	259	32	297	21	57.4	5.1	336	17	209
PINTAIL *Anas acuta*		266	21	21	75	12	15.4	3.8	118	12	130	253	21	296	15	59.6	4.1	338	17	222
GARGANEY *Anas querquedula*	18/2	15	86	14	101	11	20.3	2.9	122	16	1									
BLACK-THROATED DIVER *Gavia arctica*		96	27	34	111	5	23.6	3.9	142	8	20	276	18	317	8	62.6	4.0	347	12	206
SOOTY SHEARWATER *Puffinus griseus*	4/18	0									47	247	19	277	11	55.1	3.6	314	25	
BALEARIC SHEARWATER *Puffinus mauretanicus*	9/15	15									18	213	22	238	13	44.9	3.5	276	31	
MARSH HARRIER *Circus aeruginosus*		5									18	223	13	258	9	51.1	4.9	308	26	
MERLIN *Falco columbarius*		40	17	16	81	7	14.9	5.0	123	11	65	238	12	297	7	58.7	4.9	352	12	216
EURASIAN HOBBY *Falco subbuteo*		31	117	7	141	5	26.9	3.1	170	10	16	205	24	253	14	48.6	4.9	282	9	112
PIED AVOCET *Recurvirostra avosetta*	14/10	31	84	21	103	15	16.3	3.0	129	15	17	303	33	307	35	50.8	0.5	310	37	204
EUROPEAN GOLDEN PLOVER *Pluvialis apricaria*	12/18	6									73	233	24	275	19	55.5	5.1	313	19	
BAR-TAILED GODWIT *Limosa lapponica*		5,762	58	30	119	3	23.8	1.4	143	11	230	229	28	259	24	51.4	3.6	301	37	140
WHIMBREL *Numenius phaeopus*		640	99	9	121	4	24.9	1.6	149	13	46	196	11	229	9	46.3	3.5	267	21	108

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
CURLEW *Numenius arquata*		302	27	19	95	8	19.1	5.0	170	14	167	188	8	259	14	52.4	6.2	332	17	165
COMMON SANDPIPER *Actitis hypoleucos*		9									13	196	12	224	8	44.5	3.8	253	20	
COMMON GREENSHANK *Tringa nebularia*	17/16	4									15	209	16	235	10	46.4	3.2	264	24	
POMARINE SKUA *Stercorarius pomarinus*		167	77	42	125	5	25.6	1.8	142	6	19	238	23	275	25	53.9	5.1	320	26	150
ARCTIC SKUA *Stercorarius parasiticus*		273	63	36	119	2	23.3	2.3	159	14	463	197	13	256	8	51.3	4.0	323	19	137
GREAT SKUA *Stercorarius skua*		98	26	37	105	11	21.6	4.7	153	17	120	210	18	273	11	54.4	5.1	342	16	168
YELLOW-LEGGED GULL *Larus michahellis*	11/11*	16	31	51	120	30	10.8	10.6	177	9	134	183	1	232	9	40.7	7.3	349	15	112
BLACK TERN *Chlidonias niger*		199	110	4	130	5	25.9	1.9	163	15	1,120	197	12	241	7	49.0	2.5	281	19	112
COMMON KINGFISHER *Alcedo atthis*	5/18	1									15	228	25	273	19	48.7	5.7	310	35	
GREAT SPOTTED WOODPECKER *Dendrocopos major*	17/17	11	19	21	55	18	6.9	4.9	90	29	89	206	15	278	12	53.7	6.8	348	14	223
HOUSE MARTIN *Delichon urbicum*		231	105	9	138	5	27.6	2.5	172	9	21,435	197	12	266	5	53.4	1.7	308	7	128
TREE PIPIT *Anthus trivialis*		21	101	8	119	6	23.9	1.1	137	10	144	220	9	254	8	51.7	2.9	284	8	135
ROCK PIPIT *Anthus petrosus*	17/18	6									56	264	21	293	5	58.6	2.6	325	11	
YELLOW WAGTAIL *Motacilla flava*		157	97	7	121	3	24.5	2.2	166	15	1,828	188	8	240	3	48.5	2.8	285	9	118
GREY WAGTAIL *Motacilla cinerea*		7									147	213	21	267	4	53.4	3.2	308	12	
PIED/WHITE WAGTAIL *Motacilla alba*	16/15	97	68	9	87	6	15.2	2.5	127	18	474	233	25	285	4	53.9	2.8	323	7	198
COMMON REDSTART *Phoenicurus phoenicurus*		25	100	9	115	7	22.6	2.0	134	11	87	221	16	258	6	51.8	3.0	289	8	143
WHINCHAT *Saxicola rubetra*		16	116	6	126	5	24.9	1.5	139	9	143	219	11	251	5	50.2	2.7	289	14	125
RING OUZEL *Turdus torquatus*		14	90	22	109	10	21.3	2.0	123	13	112	264	16	283	15	56.9	1.7	305	9	174
BLACKCAP *Sylvia atricapilla*		52	82	30	118	7	23.8	2.8	149	14	196	217	24	274	6	55.4	3.6	333	17	157
GARDEN WARBLER *Sylvia borin*		31	118	7	132	6	26.0	2.0	149	11	50	215	12	245	14	47.7	4.0	292	10	113
LESSER WHITETHROAT *Sylvia curruca*		66	115	5	134	6	25.4	3.0	170	12	287	198	18	246	6	49.7	3.4	287	17	111
CHIFFCHAFF *Phylloscopus collybita*		557	11	18	102	8	19.8	5.0	173	9	1,528	197	20	276	3	54.5	3.7	356	7	175

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
WILLOW WARBLER *Phylloscopus trochilus*		521	88	4	114	6	22.9	2.4	160	12	1,149	199	8	234	4	46.8	2.7	287	15	119
SPOTTED FLYCATCHER *Muscicapa striata*		31	124	7	139	4	27.8	1.7	156	9	52	230	5	253	5	50.3	2.5	277	10	114
PIED FLYCATCHER *Ficedula hypoleuca*		5									48	220	7	244	7	49.1	2.7	271	15	
COAL TIT *Periparus ater*	10/12	4									74	276	15	286	12	50.4	1.6	302	13	
JAY *Garrulus glandarius*	12/5	19	127	15	135	11	18.4	1.7	146	17	2									
JACKDAW *Corvus monedula*		204	64	15	114	11	22.7	5.0	161	9	289	242	22	291	7	59.9	2.9	320	14	176
ROOK *Corvus frugilegus*		59	59	21	102	10	20.1	4.8	151	18	89	235	30	283	9	56.1	3.2	313	13	181
TREE SPARROW *Passer montanus*		47	91	37	124	14	24.8	3.0	146	16	416	222	22	285	7	58.3	3.8	318	7	161
BRAMBLING *Fringilla montifringilla*	17/18	16	73	20	97	7	16.9	3.0	119	14	330	273	7	299	6	59.7	2.2	332	13	202
GOLDFINCH *Carduelis carduelis*	*	587	15	20	119	5	23.4	3.5	172	10	10,167	193	16	288	3	58.1	2.5	354	8	169
SISKIN *Carduelis spinus*		66	37	27	82	19	15.6	4.3	139	29	2,517	236	34	290	7	57.6	3.0	344	17	209
REDPOLL *Carduelis cabaret/flammea*	13/12	12	76	30	108	13	16.2	3.0	126	17	667	248	31	300	8	52.7	2.6	337	11	192
REED BUNTING *Emberiza schoeniclus*	*	571	32	21	119	9	18.5	6.4	179	5	719	185	7	266	23	56.1	6.0	340	11	147
CORN BUNTING *Emberiza calandra*	18/17	115	94	36	133	17	27.2	2.9	157	10	9									
2. Spring and/or autumn migration peaks, with summer presence																				
LITTLE TERN *Sternula albifrons*		542	104	5	125	3	25.1	1.8			77			234	13	47.9	3.9	267	15	109
SANDWICH TERN *Sterna sandvicensis*	*	7,175	64	15	116	5	21.8	3.4			3,950			237	13	50.2	4.8	314	20	121
COMMON TERN *Sterna hirundo*	*	15,194	89	5	132	8	25.3	3.1			13,773			231	8	48.1	4.5	301	10	99
ARCTIC TERN *Sterna paradisaea*	*	586	98	25	121	7	24.3	2.1			410			258	8	52.3	4.1	305	19	137
EURASIAN COLLARED DOVE *Streptopelia decaocto*		48	52	25	120	7	25.3	5.4			46			272	9	55.7	6.1	315	12	151
EUROPEAN TURTLE DOVE *Streptopelia turtur*		60	117	14	141	7	28.2	2.7			30			243	13	47.8	4.2	277	12	102
SAND MARTIN *Riparia riparia*		93	87	13	126	12	23.9	4.1			14,033			238	8	48.3	3.2	289	12	112
SWALLOW *Hirundo rustica*		2,263	90	5	132	3	26.7	2.9			55,810			262	4	53.1	2.7	318	8	130

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
BLACK REDSTART *Phoenicurus ochruros*		172	35	30	106	16	19.4	5.8			138			272	18	58.0	7.4	342	15	166
NORTHERN WHEATEAR *Oenanthe oenanthe*	*	908	70	6	120	13	21.4	5.1			1,151			242	28	46.5	4.8	304	11	122
SEDGE WARBLER *Acrocephalus schoenobaenus*		17	109	10	129	8	24.1	2.6			66			233	6	45.4	3.3	269	7	104
EURASIAN REED WARBLER *Acrocephalus scirpaceus*	*	348	113	5	146	5	30.3	3.2			381			223	12	43.6	4.2	288	12	77
COMMON WHITETHROAT *Sylvia communis*	*	721	103	6	131	11	26.3	3.1			841			227	9	44.7	4.1	288	12	96
CHAFFINCH *Fringilla coelebs*	*	676	40	22	118	28	19.4	6.6			3,051			295	5	60.1	3.8	346	7	177
LINNET *Carduelis cannabina*	*	2,659	44	26	112	16	20.6	3.8			8,562			268	14	55.0	4.4	349	7	156
COMMON CROSSBILL *Loxia curvirostra*	9/15	3									21			251	32	46.5	3.8	282	35	
3. Spring and/or autumn peaks, but with summer and winter presence																				
MUTE SWAN *Cygnus olor*		127			121	15	23.8	6.5			175			264	14	51.0	6.9			143
COMMON SHELDUCK *Tadorna tadorna*		304			92	10	19.9	7.0			180			308	15	62.9	6.1			216
MALLARD *Anas platyrhynchos*		129			89	14	14.1	7.1			96			275	19	54.4	8.0			187
COMMON EIDER *Somateria mollissima*		1,055			79	11	18.3	5.8			350			318	14	65.5	6.0			239
COMMON SCOTER *Melanitta nigra*		19,884			102	6	19.2	4.7			4,379			286	19	59.1	9.0			184
RED-LEGGED PARTRIDGE *Alectoris rufa*	18/12	63			105	17	16.0	5.0			29			256	38	46.2	5.8			151
GREAT CRESTED GREBE *Podiceps cristatus*		3,326			54	11	7.5	5.8			932			331	7	69.1	5.2			277
NORTHERN FULMAR *Fulmarus glacialis*		1,397			103	7	22.2	7.0			293			253	22	52.1	8.8			149
GREAT CORMORANT *Phalacrocorax carbo*	*	3,771			38	8	3.1	6.6			2,280			308	20	68.4	9.3			270
EUROPEAN SHAG *Phalacrocorax aristotelis*		12			88	23	18.4	6.5			5									
GREY HERON *Ardea cinerea*		26			115	17	24.5	7.2			54			266	11	52.3	7.0			151
EURASIAN SPARROWHAWK *Accipiter nisus*		65			94	9	15.7	6.4			139			281	8	55.6	6.0			187
COMMON KESTREL *Falco tinnunculus*		260			106	12	23.4	8.9			435			267	7	53.5	8.4			160
WATER RAIL *Rallus aquaticus*	14/17	9									16			306	17	58.5	5.5			

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
COMMON MOORHEN *Gallinula chloropus*		172			89	19	14.2	8.4			276			277	15	55.9	8.3			188
COMMON COOT *Fulica atra*	*	1,350			83	19	5.3	9.1			1,523			287	23	63.7	9.1			204
EURASIAN OYSTERCATCHER *Haematopus ostralegus*	*	1,015			100	13	17.9	7.1			431			279	28	59.4	9.6			179
RINGED PLOVER *Charadrius hiaticula*		49			114	15	21.4	6.2			62			239	10	48.3	4.6			125
COMMON REDSHANK *Tringa totanus*		19			114	22	23.3	4.9			9									
LITTLE GULL *Hydrocoloeus minutus*		552			103	19	21.1	4.8			1,332			278	13	58.5	5.3			176
LESSER BLACK-BACKED GULL *Larus fuscus*	*	616			88	28	17.3	10.1			1,022			258	24	48.1	9.0			170
STOCK DOVE *Columba livia*		176			119	18	21.6	7.4			1,152			296	13	62.0	5.1			177
COMMON WOODPIGEON *Columba palumbus*	*	3,854			113	14	20.0	5.4			4,076			277	23	57.5	6.3			165
GREEN WOODPECKER *Picus viridis*		95			77	30	7.9	7.5			193			271	13	51.6	7.9			194
SKYLARK *Alauda arvensis*	*	483			97	28	14.5	7.2			1,315			282	29	61.3	5.9			185
MEADOW PIPIT *Anthus pratensis*	*	1,602			88	8	16.6	5.0			7,481			271	2	54.0	4.1			183
WINTER WREN *Troglodytes troglodytes*	*	262			68	27	13.5	6.3			613			297	18	59.7	6.2			229
DUNNOCK *Prunella modularis*	*	456			83	31	16.6	7.5			455			273	16	53.8	7.8			191
EUROPEAN ROBIN *Erithacus rubecula*	*	247			65	14	10.9	6.9			1,605			293	14	58.8	5.4			228
STONECHAT *Saxicola torquatus*		114			78	29	13.8	5.9			221			282	18	56.3	5.6			204
BLACKBIRD *Turdus merula*	*	811			88	15	14.3	8.0			1,619			295	20	60.4	6.4			207
BLUE TIT *Cyanistes caeruleus*	*	458			74	29	10.7	8.3			788			279	15	56.5	8.2			204
GREAT TIT *Parus major*	*	441			99	9	18.3	8.1			623			270	14	51.8	8.6			171
MAGPIE *Pica pica*	*	503			79	11	12.9	8.4			360			280	16	55.8	9.3			200
CARRION CROW *Corvus corone*	*	963			89	8	19.3	7.3			652			284	14	58.7	7.9			195
COMMON STARLING *Sturnus vulgaris*	*	11,704			100	20	22.4	9.7			36,582			288	33	61.0	7.9			187
HOUSE SPARROW *Passer domesticus*	*	400			88	15	16.2	9.2			613			272	17	54.6	7.9			184

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
BULLFINCH *Pyrrhula pyrrhula*	12/16	3									14			304	10	58.2	1.6			
4. Spring and/or autumn peaks, with winter presence																				
BRENT GOOSE *Branta bernicla*		18,135			76	4	15.7	3.6	144	12	4,897	246	27	297	7	59.1	3.3			221
EURASIAN WIGEON *Anas penelope*		580			48	18	9.2	5.3	115	13	800	244	14	306	12	61.8	5.5			258
EURASIAN TEAL *Anas crecca*		384			71	17	14.2	5.5	130	19	401	223	15	294	18	59.4	6.0			223
NORTHERN SHOVELER *Anas clypeata*		442			88	6	17.6	3.3	135	16	55	237	24	291	12	56.9	5.7			203
TUFTED DUCK *Aythya fuligula*		182			62	13	10.8	5.6	141	24	51	255	45	319	14	64.2	4.8			257
GREATER SCAUP *Aythya marila*	12/14	27			72	24	10.6	2.5	99	25	6									
VELVET SCOTER *Melanitta fusca*		154			95	8	21.1	4.8	133	7	45	283	33	322	10	64.6	4.3			227
COMMON GOLDENEYE *Bucephala clangula*	17/18	11			60	18	9.9	5.3	93	17	8									
RED-BREASTED MERGANSER *Mergus serrator*		656			97	5	19.7	3.8	140	13	209	271	25	316	5	63.1	3.3			219
LITTLE GREBE *Tachybaptus ruficollis*	14/18	7									12	279	31	317	12	61.9	5.2			
PEREGRINE *Falco peregrinus*		13			91	18	15.4	6.4	132	24	16	222	22	281	15	51.9	7.3			190
GREY PLOVER *Pluvialis squatarola*		289			114	22	24.2	4.4	142	7	131	218	19	278	22	59.6	6.6			164
RED KNOT *Calidris canutus*		545			99	35	20.7	4.5	134	16	208	238	15	301	30	61.8	5.2			202
SANDERLING *Calidris alba*		524			112	14	23.1	6.1	153	12	202	216	21	288	24	58.8	6.8			176
DUNLIN *Calidris alpina*		487			77	24	12.0	7.5	142	6	577	199	11	294	20	61.2	7.0			217
COMMON SNIPE *Gallinago gallinago*	17/18	13			62	22	9.8	5.2	100	16	32	225	22	287	17	56.0	5.9			225
EURASIAN WOODCOCK *Scolopax rusticola*	15/18	13			69	18	11.4	2.9	86	9	9									
GLAUCOUS GULL *Larus hyperboreus*	15/6*	10			39	24	4.7	3.9	57	35	1									
RAZORBILL *Alca torda*	*	795			40	21	4.6	5.3	138	20	129	233	41	317	16	64.1	5.2			277
FIELDFARE *Turdus pilaris*		362			76	16	13.3	4.5	119	15	284	283	10	306	6	61.4	1.9			230
SONG THRUSH *Turdus philomelos*	*	150			76	15	18.3	5.7	145	22	674	225	30	292	6	57.4	3.3			216

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
REDWING *Turdus iliacus*	*	686			77	9	15.2	2.8	119	19	935	273	8	293	19	58.9	2.8			216
GOLDCREST *Regulus regulus*	*	314			61	21	15.1	5.0	118	18	1,416	246	15	298	10	59.8	3.7			237
FIRECREST *Regulus ignicapilla*		105			68	15	13.4	5.3	129	14	231	254	12	297	13	57.8	4.3			229
LONG-TAILED TIT *Aegithalos caudatus*	12/10	32			50	28	6.9	2.5	70	28	49	302	11	319	12	51.5	2.6			269
GREENFINCH *Carduelis chloris*	*	977			37	22	2.6	6.6	163	17	7,736	210	22	319	39	59.9	3.9			282
5. Winter presence, migration peaks not discernible																				
POCHARD *Aythya ferina*	17/15	22							89	31	25	280	35							
RED-THROATED DIVER *Gavia stellata*		5,840							146	8	2,069	252	31							
TURNSTONE *Arenaria interpres*		602							142	11	746	211	12							
ICELAND GULL *Larus glaucoides*	12/2	10							95	44	0									
COMMON GUILLEMOT *Uria aalge*		*12,292							170	13	2,772	195	21							
LITTLE AUK *Alle alle*	3/17	0									36	298	22							
6. Summer presence, migration peaks not discernible																				
MANX SHEARWATER *Puffinus puffinus*	18/17	140	99	25							60							289	37	
MEDITERRANEAN GULL *Larus melanocephalus*		275	7	11							207							353	14	
ROSEATE TERN *Sterna dougallii*	15/18	9									13							243	28	
COMMON CUCKOO *Cuculus canorus*		106	113	6							41							250	15	
SWIFT *Apus apus*		4,225	116	3							4,344							267	19	
WOODLARK *Lullula arborea*	12/18	2									15							333	17	
MISTLE THRUSH *Turdus viscivorus*		33	42	33							78							325	17	
YELLOWHAMMER *Emberiza citrinella*	*	429	49	24							210							317	21	

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
7. No discernible pattern, present all year																				
GANNET *Morus bassanus*	*	7,894									11,562									
LAPWING *Vanellus vanellus*		300									264									
BLACK-LEGGED KITTIWAKE *Rissa tridactyla*	*	17,912									6,733									
BLACK-HEADED GULL *Chroicocephalus ridibundus*	*	39,457									17,230									
COMMON GULL *Larus canus*	*	15,525									3,047									
HERRING GULL *Larus argentatus*	*	57,211									22,585									
GREAT BLACK-BACKED GULL *Larus marinus*	*	13529									10,515									
PIED WAGTAIL *Motacilla alba*		454									640									

Appendix 2. A summary of the seabirds observed during dedicated watches at Dungeness Bird Observatory 1990–2007. All statistics have been based on birds counted divided by the recorded duration of sea-watching. Species within groups are arranged in taxonomic order. Scientific names of species and a key to columns are given in Appendix 1.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1. Spring and autumn migration, few or no winter or summer birds																				
SOOTY SHEARWATER	4/18	0.0									0.1	246	17	275	11	55.0	5.9	312	26	
BALEARIC SHEARWATER	9/15	<0.1									<0.1	216	23	233	18	45.4	6.1	272	18	
BLACK-THROATED DIVER		0.1	31	39	102	16	21.5	6.8	137	14	0.1	291	28	325	13	66.0	3.0	344	17	223
POMARINE SKUA		0.1	82	42	117	27	24.2	2.7	133	27	<0.1	254	30	279	26	56.6	4.4	310	31	162
ARCTIC SKUA		0.3	59	38	115	20	22.4	3.8	148	21	1.0	214	24	258	12	50.8	4.0	317	25	142
GREAT SKUA		0.1	23	36	95	21	19.1	7.6	140	19	0.2	229	37	278	28	55.0	5.9	343	15	184
YELLOW-LEGGED GULL	11/11*	<0.1	10	9	73	35	20.0	13.0	139	44	0.3	227	51	268	43	50.5	6.5	348	17	195
BLACK TERN		0.2	111	6	132	7	27.6	2.9	147	13	1.5	219	19	247	10	49.7	2.9	277	19	115
2. Spring and autumn migration peaks, with summer presence																				
LITTLE TERN		0.5	106	7	127	4	26.6	2.7			0.1			239	17	48.1	3.6	263	16	112
SANDWICH TERN	*	12.6	71	10	116	11	23.9	4.0			9.3			247	14	48.0	3.5	307	24	131
ARCTIC TERN	*	0.5	97	28	123	7	25.7	2.9			1.0			259	13	53.1	3.7	298	26	136
3.Spring and autumn migration peaks, but with summer and winter presence																				
COMMON EIDER		2.3			63	18	14.7	7.2			1.3			326	18	66.5	5.5			263
COMMON SCOTER		25.0			94	17	18.4	6.1			20.3			299	36	62.3	7.9			205
GREAT CRESTED GREBE		24.4			51	16	9.1	5.6			9.1			340	6	69.3	4.6			289
LITTLE GULL		0.6			87	33	17.7	6.8			2.4			283	26	57.4	5.0			196
LESSER BLACK-BACKED GULL	*	2.4			65	28	14.1	8.1			3.2			279	31	53.1	8.4			214

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
4. Spring and autumn migration peaks, with winter presence																				
VELVET SCOTER		0.2			81	19	17.9	7.5	129	14	0.2	301	42	333	14	67.3	8.3			251
RED-BREASTED MERGANSER		0.8			88	11	20.1	5.7	136	19	0.6	278	36	322	16	64.1	3.3			234
LITTLE GREBE	14/18	<0.1									0.1	290	35	324	17	64.5	5.2			
RAZORBILL	*	2.2			33	18	5.9	5.6	129	19	0.5	254	46	320	15	65.7	6.4			287
5. Winter presence, migration peaks not discernible																				
SCAUP	12/14	<0.1							93	30	<0.1									
COMMON GOLDENEYE	17/18	<0.1							92	19	<0.1									
RED-THROATED DIVER		22.1							137	26	13.9	274	29							
EUROPEAN SHAG		<0.1							115	35	<0.1									
ICELAND GULL	12/2	<0.1							96	39	0.0									
GLAUCOUS GULL	15/6*	<0.1							64	37	<0.1									
COMMON GUILLEMOT	*	53.3							147	33	9.1	225	42							
LITTLE AUK	3/17	0.0									<0.1	303	26							
6. Summer presence, migration peaks not discernible																				
MANX SHEARWATER	18/17	0.2	108	10							0.1							281	27	
MEDITERRANEAN GULL		0.5	10	16							0.4							349	14	
COMMON TERN	*	22.4	89	4							35.6							295	17	
ROSEATE TERN	15/18	<0.1									<0.1							254	25	
7. No discernible pattern, present all year																				
NORTHERN FULMAR		2.5									0.9									
NORTHERN GANNET	*	18.4									44.6									
GREAT CORMORANT	*	17.2									16.2									
BLACK-LEGGED KITTIWAKE	*	58.3									30.2									
BLACK-HEADED GULL	*	141.2									104.6									
COMMON GULL	*	54.8									17.7									
HERRING GULL	*	228.0									125.4									
GREAT BLACK-BACKED GULL	*	54.8													48.6					