BIRD POPULATIONS

A journal of global avian demography and biogeography

Volume 6 2001-2002

Published annually by The Institute for Bird Populations

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The Institute for Bird Populations

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BIRD POPULATIONS (ISSN 1074-1755) is published annually by The Institute for Bird Populations.

POSTMASTER: Send address changes to The Institute for Bird Populations, P.O. Box 1346, Point Reyes Station, CA 94956-1346.

Printed at Ann Arbor, Michigan, U.S.A. by Sheridan Books, Inc.

PRINTED ON RECYCLED ♻ ACID-FREE PAPER

BIRD POPULATIONS

A journal of global avian demography and biogeography

Volume 6 2001-2002

Bird Populations 6:1-12

CALIFORNIA BLACK RAILS IN THE SAN FRANCISCO BAY REGION: SPATIAL AND TEMPORAL VARIATION IN DISTRIBUTION AND ABUNDANCE[1]

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Abstract. We conducted surveys at 352 listening stations in 26 tidal marshes in the San Francisco Bay region in 1996 that we had surveyed previously in 1986-1988. The majority of these marshes were associated with San Pablo Bay (n = 14 marshes, 53.9%); the remainder were associated with Suisun Bay and Carquinez Strait (n = 5, 19.2%) or the outer coast (n = 7, 26.9%). Estimates of density for California Black Rails are confounded by a variety of environmental factors, as well as movement of birds in response to the playback of tape recordings of vocalizations. We attempted to control inherent bias, interpolated abundance indices from our data, and derived abundance rankings for discrete representative marshes associated with San Francisco Bay and the outer coast. Compared to 1986-1988, slightly higher detection rates were encountered in San Pablo and Suisun bays during 1996, but lower rates were encountered on the outer coast. An analysis of interdecadal variation suggested an increase in the populations in San Pablo and Suisun bays and a decrease in the isolated populations in the outer coast marshes, however those trends did not cross the threshold of significance. We found that the probability that rails were present in a marsh increased significantly as marsh size increased. We also analyze the relationship between marsh size and abundance indices, and discuss factors that bias estimates as well as summarize factors that likely influence the population distribution of rails.

Keywords: abundance index, Black Rail, California, *coturniculus*, abundance indices, DISTANCE, San Francisco Bay, tidal marshland, *Laterallus, jamaicensis.*

LA POLLUELA NEGRA DE CALIFORNIA EN LA REGIÓN DE LA BAHÍA DE SAN FRANCISCO: VARIACIÓN ESPACIAL Y TEMPORAL EN DISTRIBUCIÓN Y ABUNDANCIA.

Resumen. Muestreamos 352 estaciones de escucha en 26 humedales de marea de la región de la Bahía de San Francisco en 1996, previamente muestreadas de 1986 a 1988. La mayoría

[1]Received: 5 March 2001. Accepted: 10 August 2002.

de los humedales están asociados a la Bahía de San Pablo (n = 14 humedales, 53.9%); el resto están asociados con la Bahía Suisun y el Estrecho de Carquinez (n = 5, 19.2%) o la costa del Pacífico (n = 7, 26.9%). Las estimas de densidad de la polluela negra de California *(Laterallus jamaicensis coturniculus)* contienen sesgos causados por diversos factores ambientales, así como por el movimiento de las aves como consecuencia del play-back de grabaciones de vocalizaciones. Intentamos controlar el sesgo intrínseco, realizamos interpolaciones de índices de abundancia a partir de nuestros datos, y derivamos rankings de abundancia para humedales representativos asociados con la Bahía de San Francisco y la costa del Pacífico. Comparado con el periodo 1986-1988, en 1996 encontramos tasas de detección ligeramente más altas en las bahías de San Pablo y Suisun, pero las tasas fueron más bajas en la costa. Los análisis de variación interdecadal sugieren aumentos en las poblaciones de las bahías de San Pablo y Suisun, y un declive en las poblaciones aisladas de la costa, aunque estas tendencias no son significativas. Encontramos que la probabilidad de que las polluelas estén presentes en un humedal aumenta significativamente con el tamaño del mismo. También analizamos la relación entre el tamaño del humedal y los índices de abundancia, discutimos los factores que pueden sesgar las estimas y resumimos los factores que probablemente influencian la distribución de las polluelas.

Palabras clave: índice de abundancia, polluela negra, California, Laterallus *jamaicensis coturniculus*, DISTANCE, Bahía de San Francisco, humedal de marea.

LES RALES NOIRS DE CALIFORNIE DANS LA REGION DE LA BAIE DE SAN FRANCISCO: VARIATION SPATIALE ET TEMPORELLE DE DISTRIBUTION ET D'ABONDANCE

Résumé. En 1996, nous avons réalisé des recensements sur 352 stations d'écoute dans 26 marécages de marée de la région de la Baie de San Francisco que nous avions déjà recensés en 1986-1988. La majorité de ces marécages étaient associés à la Baie de San Pablo (*n* = 14 marécages, 53.9%), les autres à la Baie de Suisun et au Détroit de Carquinez (*n* = 5, 19.2%) ou à la côte extérieure (*n* = 7, 26.9%). Divers facteurs environnementaux, ainsi que les déplacements des oiseaux suite aux émissions de vocalisations enregistrées, sont confondants pour les estimations de densité des Râles noirs de Californie. Nous avons tenté de contrôler ces biais inhérents, interpolé des indices d'abondance à partir de nos données, et dérivé des classements d'abondance pour les marais représentatifs associés à la Baie de San Francisco et à la côte extérieure. Par rapport à1986-1988, les taux de détection étaient légèrement supérieurs dans les baies de San Pablo et Suisun, mais étaient plus faibles sur la côte extérieure en 1996. Une analyse des variations entre décennies a suggéré une augmentation des populations des baies de San Pablo et Suisun et une diminution des populations isolées des marais de la côte extérieure ; cependant ces tendances n'atteignaient pas le seuil de significativité. Nous avons mis en évidence une augmentation significative de la probabilité de présence des râles dans un marais avec la taille du marais. Nous avons par ailleurs analysé la relation entre la taille du marais et les indices d'abondance, nous discutons des facteurs qui biaisent les estimations, et nous résumons les facteurs qui influencent probablement la distribution de la population de râles.

Mots-clés: index d'abondance, Râle noir, Californie, *coturniculus*, indices d'abondance, DISTANCE, Baie de San Francisco, marécages de marée, *Laterallus, jamaicensis.*

RÄUMLICHE UND ZEITLICHE VARIATION IN VERBREITUNG UND HÄUFIGKEIT KALIFORNISCHER SCHIEFERRALLEN IN DER BUCHT VON SAN FRANCISCO

Zusammenfassung. Im Jahr 1996 führten wir Erfassungen an 352 Standorten in 26 Flutungsmarschen in der Bucht von San Francisco durch, die einen Vergleich mit Daten von 1986-88 ermöglichen. Die meisten Flächen lagen im Bereich der San Pablo-Bucht (*n* = 14 Marschen, 53.9%), die anderen umfassten Bereiche der Suisun Bucht und dem Carquinez Sund (*n* = 5, 19.2%) bzw. an der Außenküste (*n* = 7, 26.9%). Hochrechnungen des Schieferrallenbestandes werden durch eine Reihe von Umweltfaktoren beeinflusst sowie durch Ortswechsel der Vögel als Reaktion auf den Einsatz von Klangattrappen. Wir versuchten auf systematische Fehler zu kontrollieren, interpolierten Häufigkeitsindizes aus den Daten und ermittelten Häufigkeitsranglisten für einzelne repräsentative Marschen der San Francisco Bucht und der Außenküste. Im Vergleich zu 1986-88 war die Entdeckbarkeit

der Art im Jahr 1996 in den Buchten von San Pablo und Suisun leicht erhöht, an der Außenküste aber geringer. Die Analyse der Bestandsveränderungen über die verschiedenen Dekaden legt eine leichte Zunahme für die Buchten von San Pablo und Suisun nahe, und eine Abnahme für die isolierten Populationen in den Marschen der Außenküste, aber keine der Veränderungen war signifikant. Wir ermittelten eine höhere Antreffwahrscheinlichkeit für die Rallen mit zunehmende Größe der Marschflächen. Schließlich untersuchen wir auch den Zusammenhang zwischen der Größe der Marschen und den einzelnen Häufigkeitsklassen, diskutieren mögliche Fehlerquellen bei der Bestandsberechnung und beurteilen den Einfluss verschiedener Faktoren auf die Verteilung der Rallen in den Untersuchungsgebieten.

Schlüsselwörter: Häufigkeitsindex, Schieferralle, Kalifornien, *coturniculus*, DISTANCE, San Francisco Bucht, Flutungsmarschen, *Laterallus, jamaicensis.*

INTRODUCTION

Tidal marshlands of the San Francisco Bay region support most of the California Black Rail *(Laterallus jamaicensis coturniculus)* population in the western United States (Manolis 1978, Evens et al. 1991). The remainder occur in small, isolated populations in the outer coast tidal marshes (Bodega Bay, Tomales Bay, Bolinas Lagoon, and Morro Bay), freshwater marshes and swales associated with the Colorado River and Salton Sea, and in freshwater marshes of the low Sierran foothills (Repking and Ohmart 1977, Evens et al. 1991, Eddleman et al. 1994, Aigner et al. 1995, Tecklin 1999). However, the latter sites support less than 10% of the total population and, because of fragmentation, they may be susceptible to stochastic extinctions (Evens et al. 1991, PRBO unpubl. data). Former breeding populations in central and south San Francisco Bay and the coastal marshes of southern California have apparently been extirpated (Evens et al. 1991, Eddleman and Evens 1994, Eddleman et al. 1994). The historical and ongoing pressures of agriculture, salt production, and urbanization have reduced tidal marshlands of San Francisco Bay by an estimated 85% (Dedrick 1993), with a concomitant reduction in Black Rail populations (Evens et al. 1991).

In the San Francisco Bay estuary, Black Rails are now confined to remnants of historical tidal marshlands in the northern reaches, primarily those associated with San Pablo and Suisun bays (Manolis 1978, Evens et al. 1991, PRBO unpubl. data). In this study, we surveyed 20 marshes within the estuary and 8 marshes in four embayments on the outer coast. The data obtained were used to compare with earlier studies, to estimate total population size and to evaluate the status of those populations.

METHODS

Earlier studies (Manolis 1978, Evens et al. 1991, PRBO unpubl. data) determined that in the San Francisco Bay area Black Rails occur almost exclusively in tidally-influenced marshes, in particular, those with unrestricted tidal flow, classified as "estuarine, intertidal, emergent, regularly flooded" (Cowardin et al. 1979, USFWS 1991). In the present study, therefore, we restricted coverage to tidally-influenced marshes.

A total of 27 marsh parcels ranging in size from 9.1 to 149.3 ha (mean = 68.2 ±S.E. 8.35 ha) were surveyed during the period 9 April-28 June 1996. Included were sites that had been previously surveyed in a larger synoptic survey during the period 30 March-2 June 1986-88 (PRBO unpubl. data) (Table 1). Of all sites surveyed, 85% were fully tidal, and 15% were influenced by muted tidal flow. Among marsh parcels surveyed in 1996, 14 (51.9%) were within San Pablo Bay or its major tributaries [mean 73.7 ±11.02 ha; Dedrick (1993)], five (18.5%) were in the Suisun Bay and the Carquinez Strait (mean 87.7 ±22.87 ha), and eight (29.6%) were associated with the outer coast (mean 43.29 ±12.02 ha). Sites in south and central San Francisco Bay were not surveyed because Black Rails were observed at only one of 15 sites in these marshes in 1986-1988 (PRBO unpubl. data). Two sites were sampled on more than one occasion in 1996: Dutchman's Slough (Site # 13, Table 1) on the Napa River and Southhampton Marsh (Site # 17) in Carquinez Straight.

TABLE 1. Summary of the results of 1988 and 1996 Black Rail surveys[a].

Site No.	Location	Stations, n	Marsh size (ha)	Birds/ station 1998 ≤ 30m	Birds/ station 1996 ≤ 30m	A.I.[b] 1998	A.I.[b] 1996	Rank[c] 1996
San Pablo Bay								
1&2	China Camp/Gallinas Creek (S)	24	103	0.10	0.04	0.12	0.09	Low
3.	Gallinas Creek mouth (N)	24	130.4	0.03	0.29	0.07	0.88	Mod
4.	Hamilton Shore	10	39.7	nd	0.00	0.00	0.00	Low
5.	Sonoma Baylands	14.5	100.6	0.70	1.17	1.22	2.89	High
6	Sonoma Creek mouth	13	72.3	0.70	0.31	0.58	0.56	Low
7	Napa Slough	17	54.6	0.61	0.29	0.95	0.71	Mod
8a	Mare Island Point (E)	17	144.2	0.37	0.35	0.90	0.85	Mod
8b	Mare Island Point (NW)	11	36.6	nd	0.08	nd	0.19	Low
9,10	Black John Slough	21	139.2	1.20	1.19	1.53	2.89	High
11	White Slough, Napa River	10	63.9	0.67	0.01	0.97	0.24	Low
12	Wilson Ave, Napa River	07	28.6	0.10	0.00	0.00	0.00	Low
13	Dutchman's Slough, Napa River	04	9.1	1.00	1.25	2.43	3.04	High
14	Coon Island	—	160.3	0.62	nd	1.51	Na	Mod
15	Fagan Slough	20	126.4	0.85	1.58	2.06	3.84	High
16	Bull Island*	09	67.5	0.23	0.11	0.00	0.00	Low
Suisun Bay & Carquinez Strait								
17	Southhampton (Benecia)	12	54.2	0.24	0.92	0.58	1.65	Mod
18	Cutoff Slough (N)	22	115.2	0.26	0.36	0.65	0.85	Mod
19	Cutoff Slough (E)	21	149.3	nd	1.00	1.90	2.55	High
20a	Hill Slough tidal	24	19.6	nd	0.58	nd	1.31	Mod
20b	Hill slough diked*	11	100.0			nd	0.00	Low
Outer Coast								
21	Tomales Bay (south end)	18	45.0	0.30	0.39	1.38	0.95	Mod
21b	Tomales Bay (Tomasini Pt.)	06	~50	nd	0.00	0.00	0.00	Low
21c	Tomales Bay (Bivalve)*	03	~50	nd	0.00	0.00	0.00	Low
22d	Tomales Bay (Ocean Roar)	06	~50	nd	0.00	0.00	0.00	Low
23a	Drakes Bay (Johnson's)	04	~5.0	nd	0.25	0.89	0.69	Mod
23b	Drakes Bay *	06	5.0	0.00	0.00	0.00	0.00	Low
24	Bolinas Lagoon	13	98.0	0.11	0.31	1.10	0.75	Mod
25	Bodega Bay (Doran Park)	15	~5.0	0.00	0.20	0.00	0.49	Low

*Sites with muted tidal flow (as opposed to fully tidal).

[a]nd = no data available; parentheses indicate sites included as part of another parcel. Estimated size is preceeded by tilde (~).

[b]Abundance indices (A.I.) represent an estimate of the number of birds per hectare as calculated from the number of birds detected per station times the effective census area (36.2 2 m = 0.4115 ha).

[c]Rank (conforms to Evens et al. 1989): Low = < 0.60 rails ha^{-1}; Moderate (Mod) = 0.60 - 2.12 rails ha^{-1}; High = >2.12 rails ha^{-1}.

Listening stations (aural sampling stations) were located along transects selected to sample elevational change within each marsh and were distributed throughout the length and breadth of the marsh at or above mean high water. Census stations were distributed at 100-m intervals through each marsh parcel and, where possible, each station was at least 50 m from upland habitat. Where possible, listening stations were located at the same sites as the 1986-1988 surveys.

In 1996 a total of 352 listening stations, selected from among the 1108 stations sampled in 1986-1988, were sampled by one observer. Of the stations sampled in 1996, 296 (84.1%) were located in the San Francisco Bay estuary and 56 (15.9%) were located in outer coast marshes. Of the total stations surveyed, 9.1% were in marshes with muted tidal flow. All censuses were conducted between dawn and 0930 hrs

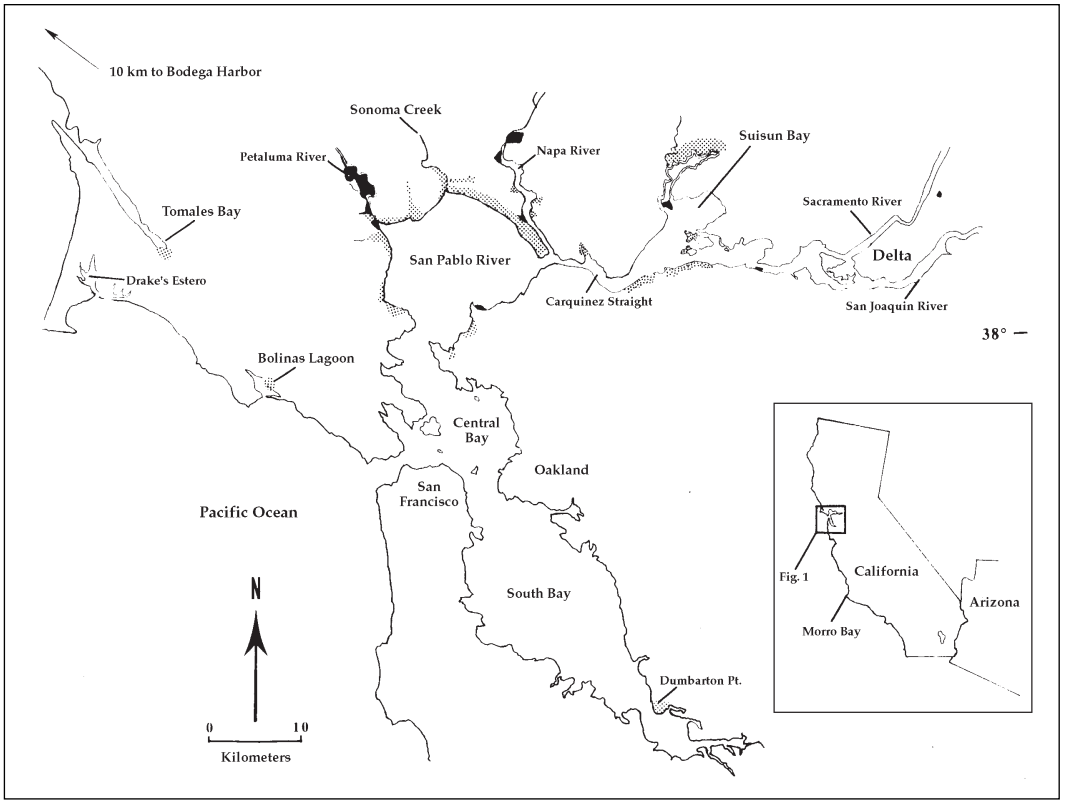

FIGURE 1. Distribution and relative abundance of Black Rails in the San Francisco Bay region. Black shading indicates high abundance; stippling indicates low to medium abundance.

Pacific Standard Time. Census efforts were canceled when wind exceeded approximately 25 km hr^{-1} or when the observer determined that background noise was interfering with the ability to detect rail vocalizations. After arriving at a listening station, the observer waited silently for one minute then broadcast a tape recording of California Black Rail vocalizations in each ordinal direction for a total of 1.5 min. The tape recording consisted of a repetitive series of *grr* calls followed by 0.5 min of *kik-kik-kerr* calls (Repking and Ohmart 1977, Eddleman et al. 1994). Maximum sound pressure 1 m from the source was approximately 90 dB. Each station was sampled for a total of 6.0 mins.

For each rail response heard within 5.0 min of initiating the broadcast, the observer recorded the time, the call type, and the estimated distance and direction from the center of the station. An effective 30-m census radius was chosen after field testing found that the observer's ability to estimate distance accurately, or hear low range vocalizations consistently, declined beyond that distance. This protocol also conformed with earlier studies (PRBO unpubl. data, J. Tecklin pers. comm.). All calls coming from one compass direction during the five-minute listening period were considered to represent only one rail unless two calls were heard simultaneously. Calls from different (>30°) compass directions were considered to represent different rails. In an earlier study it was estimated that Black Rails move toward the source of a broadcast tape an average of 6.2 m (PRBO unpubl. data); therefore, although we counted birds only within 30 m of the observer, we calculated abundance indices assuming that the effective radius of sampling stations was 36.2 m, thus covering an area of 0.412 ha (Table 1). The movement of Black Rails in response to the playback of vocalizations potentially confounds extrapolation of densities. Spear et al.

TABLE 2. Abundance indices and population estimates of Black Rails for each region. Abundance index is number of rails detected per effective census area (see Table 1). Population estimates are shown with and without adjustment for detection probability and amount of suitable habitat (see text).

	Habitat Size (ha)	Median Abundance Index ± S.E.	Median Abundance Index	Sites, n	Abundance Estimate based on Median[a]	Adjusted Abundance Estimate[b]
San Pablo Bay	5531	1.25 ± 0.345	0.71	13	3,930	7,100
Suisun & Carquinez	3780	1.43 ± 0.320	1.08	5	4,080	7,200
Outer Coast	543	0.46 ± 0.196	0.30	5	163	289

[a]Estimated number of Black Rails per region based on median abundance index only, not adjusted for detection probability or suitability of habitat.

[b]Estimated number of Black Rails per region, incorporating detection probability of 0.33 (from DISTANCE, see text) and assumption that not all habitat is suitable for Black Rails (see text).

(1999) used our correction factor and found a high degree of conformance with expected detection values (*contra* Legare et al. 1999).

Abundance indices calculated for each marsh assumed complete detectability within 36.2 m of the observer (see below), and thus provide a lower-bound estimate of abundance. Abundance rankings were assigned to each site based on the density index calculated from the 36.2 m radius circular plot as follows: <0.6 rails ha^{-1} (low); 0.6-2.1 rails ha^{-1} (moderate); >2.1 rails ha^{-1} (high). This scale conforms to our earlier analyses (PRBO unpubl. data).

The values derived from the average number of detections per hectare in each marsh parcel were also used to calculate abundance indices for each region. We then used these abundance indices to extrapolate total abundance estimates for each region. Because these estimates rely on extrapolated data, we acknowledge the considerable uncertainty associated with any estimates of absolute abundance.

To address the problem of incomplete detectability (i.e., detectability less than 100% within the survey station radius), we used the program DISTANCE (Buckland et al. 1993). The program used information regarding the distance at which each rail was detected (up to a distance of 30 m) to estimate true detection probability. Model selection in DISTANCE was conducted using the Akaike Information Criterion (AIC; Buckland et al. 1993). A second consideration we took into account in estimating absolute population size was the amount of tidally-influenced marsh habitat that was truly suitable for Black Rails. We derived estimates of the fraction of suitable habitat and then combined that estimate with the estimate of rails present but not detected in our surveys in order to derive adjusted regional estimates of total Black Rail population size.

RESULTS

RELATIVE ABUNDANCE

Abundance Indices (number of rails detected per census area) are presented in Table 1 for each marsh surveyed in 1996 (with comparison to 1988 results), assuming a detection radius of 36.2 m (see Methods). These abundance indices assume complete detectability of rails (for which, see Below) and are thus minimum estimates. We summarize relative abundance for each region, presenting both the mean (± S.E.) and median abundance index, in Table 2. The arithmetic mean was particularly sensitive to extreme low values and thus we feel the median is a better measure of the central tendency. These summary statistics included two San Pablo Bay sites and four outer coast sites with no detections, but did not include sites of muted tidal flow.

Results indicated statistically similar indices in San Pablo Bay compared to the Suisun Bay and Carquinez Straights region (Table 2). It may seem that Suisun Bay abundance values were somewhat higher (1.08 vs 0.71 for median values), but any such difference is unreliable for two reasons. First, only a few marshes were surveyed in Suisun Bay (compared to San Pablo

Bay), and sampled marshes may not be representative of the region as a whole. Second, marshes in Suisun Bay were selected because we knew, or expected, rails to occur there. In contrast, marshes of San Pablo Bay were not selected *a priori* with respect to the known presence of rails; also, we omitted the Petaluma River marsh, a site within San Pablo Bay that is known to support very high densities of Black Rails, from this analysis.

We emphasize that the primary objectives of the surveys were to compare abundance indices in 1996 with those from the 1980s and to compare marshes within a region, not to compare among regions. Also, we sampled only large, broad marshes in the Suisun system, whereas an unknown proportion of the Suisun marshland was comprised of linear strip marsh along sloughs.

BETWEEN YEAR AND BETWEEN DECADE VARIATION

We selected 16 study sites where rails were present and for which data were available from 1988 and 1996 and using these sites, compared abundance indices to determine whether there was interannual variation. The mean 1988 abundance index was 1.08 (± 0.16); the 1996 mean was 1.46 (± 0.29), suggesting a population increase of 35% within these 16 sites, but one that is not significant (*t*-test on log-transformed abundance indices). Indeed, if we consider only the largest six marshes (>100 ha) with full tidal influence from all regions for which we have data from both years, we find a mean abundance index of 1.98 (± 0.53) rails ha^{-1} in 1996 as compared to 1.19 (± 0.32) rails ha^{-1} in 1988, an increase of 66%, a difference which is also not significant (*t*-test on log-transformed values).

Another measure of interannual variation is contained in the detection fraction, i.e., the percentage of stations at which rails are detected within a marsh. In an earlier survey of San Pablo Bay marshes, Black Rails were detected at only 0.240 of the 338 stations sampled (PRBO unpubl. data) whereas in this study we detected rails at 0.470 of 212.5 stations sampled. In Suisun and Carquinez we detected birds at 0.254 of 114 stations in 1988; in 1996 we detected birds at 0.568 of 56 stations. On the Outer Coast, the rate is not available for the 1988 surveys, but in 1996 the response rate was 0.146 at 56 stations.

Although temporal variation in abundance was suggested from the difference in mean number of detections per station from 1988 to 1996, it did not cross the threshold of significance. A matched pairs *t*-test, using logs of abundance indices of all sites with detections (i.e., marshes with no detections eliminated), failed to reject the null hypothesis that there was no difference between years ($P>0.3$). When the Outer Coast sites were excluded, the tendency toward increase from 1988 to 1996 was still not significant ($P>0.15$).

REGIONAL DIFFERENCES

Our data suggested between-decade differences in abundance indices among the three regions. In Suisun Bay all three marshes that were covered in both survey years showed higher abundance indices on the later surveys. In San Pablo Bay, five increased, two decreased and the remainder were virtually unchanged (i.e., absolute change <0.05 rails ha^{-1}; Table 1). On the outer coast, three sites at which rails were present in 1988 showed a decrease in 1996. One, Bodega Bay, showed an increase. In fact, Bodega Bay was apparently colonized in the intervening years. Marshes in all regions that showed declines from 1988 to 1996 were generally small, relatively isolated from one another, and isolated from large Black Rail population centers.

A comparison of abundance indices in Table 1 also reveals that, with the exception of Bodega Bay, no marsh that had zero detections in 1988 was observed to have rails in 1996. Thus, the relatively isolated Bodega Bay site was the only 'empty' marsh that was apparently colonized in the intervening years. Conversely, all but one marsh with rails in 1988 contained rails in 1996. The marsh that held rails in 1988 but was without detections in 1996 (Site 12; Table 1) had only one bird in the earlier survey and rails have been detected there subsequent to 1996 (J. Evens, pers. obs.), therefore the difference between years was likely due to census error. Thus, no local extinctions were detected among the two time periods.

RELATIONSHIP BETWEEN MARSH SIZE AND ABUNDANCE INDICES

There was a tendency for abundance indices to increase as size of the marsh increased (P = 0.054, regression analysis of log-transformed

abundance on marsh area, ha). To clarify whether or not abundance values were indeed related to marsh area, we partitioned abundance values into two components: (1) presence of rails in a marsh (value >0), and (2) abundance indices of rails, given that rails were present in the marsh (one or more detected). To examine the first component, we classified each marsh with respect to presence (score = 1) or absence (score = 0) of rails. When results from all regions were combined, there was a significant positive relationship between marsh size and presence of rails (Likelihood Ratio Statistic = 4.38, df = 1, P = 0.036). When San Pablo Bay, the region with the greatest number and size diversity of study sites was analyzed by itself, marsh size was also significant with respect to the presence of rails (P = 0.034).

For the second component, there was a positive trend for the abundance index to increase with increasing marsh size among marshes with rails (when analyzed by region and overall) but this was not significant (P>0.3 for all four analyses). We conclude that marsh size influences the likelihood a marsh will contain rails, but it is unclear whether further gradation in Black Rail abundance is influenced by marsh size.

ABSOLUTE ABUNDANCE AND POPULATION ESTIMATION

Reliable estimation of absolute abundance requires consideration of two factors: 1) detectability of rails (proportion of rails detected within each effective census area) and 2) proportion of habitat suitable for rails. To assess the first factor, we analyzed distances at which rails were detected using the program DISTANCE (Buckland et al. 1993; see above) for observations of individuals within 30 m of the observer. Using a uniform density function with polynomial adjustments, detection probabilities were estimated to be 100% at 3 m, 75% at 5 m, 25% at 10 m, and 5% at 30 m. From this we conclude that substantial numbers of rails were being missed in our surveys. It was not possible to estimate detection probabilities on a per-marsh basis. Instead, we assumed the same detection probability function at all marshes and estimated abundance in each marsh.

For San Pablo Bay, the median detection value, as determined by DISTANCE, for the 14 marshes was 2.13 birds ha^{-1}, after adjusting for estimated bird movement toward the observer (i.e., assuming an effective radius of 36.2 m). This value is 3.0 times the median density when assuming complete detectability (Table 2). In other words, observers were detecting only 33% of rails within 36.2 m of observers. We, therefore, adjusted relative abundance estimates by a factor of 3.0 for all Bay regions, for the purpose of estimating absolute abundance.

The extent of truly suitable habitat in the Suisun Bay and San Pablo Bay regions is likely as little as 50% to 75% of the area represented by Dedrick's (1993) estimate (3,780 ha). For San Pablo Bay and Suisun bays we therefore estimated that 65% of the area is suitable habitat. For the Outer Coast, we estimate the percent of suitable habitat to be 50% (due to vegetational differences and increased edge effect) compared to San Francisco Bay.

Finally, we incorporate both the estimated fraction of truly suitable habitat within nominally-designated tidal marshland and detectability of rails, to derive estimates of total population size (Table 2). We estimate approximately 7,200 Black Rails in the San Pablo Bay system and a similar number in Suisun Bay and Carquinez Strait, with about 290 Black Rails in the Outer Coast region. However, we note that there are several other sources of bias that might reduce or inflate our estimates by an undetermined amount (see "Factors that may bias estimates," below.)

DISCUSSION

Factors that may bias estimates or obscure interpretation of results

(1) In San Francisco Bay, Black Rails tended to occur in the larger undiked marshes associated with larger rivers and in some bayshore parcels, particularly those associated with the mouths of rivers or creeks (Evens et al. 1991). Dedrick's (1993) estimates of areal extent of marshland habitat, upon which our area estimates are based, includes an as yet unknown proportion of narrow strip marshes, bayfront marshes not associated with tributary mouths and low *Spartina* or *Scirpus robustus* beds, none of which support Black Rails. We estimate that those habitats may account for 35% of the tidal marshlands of San Francisco Bay, but these

estimates are very rough.

(2) We have accounted for the movement of birds toward the observer based on observed (estimated) movement after first detection; however, we have no way of knowing whether birds move prior to their initial call, but suspect they do (see Legare et al. 1999). In effect, the tape may be acting to lure birds in from a larger area. Hence, true densities may be lower than the abundance indices reported herein.

(3) The age at which calling begins is unknown. It is possible that detections after mid-May include juvenal birds, not just adults.

(4) Little is known regarding the sex-related vocalizations of this race of Black Rail (but see Legare et al. 1999 in reference to *L. j. jamaicensis*). It is presumed that the *kik-kik-kerr* call is most often given by the male (Eddleman et al. 1994, Legare et al. 1999), but less than 10% of our detections within 30 m of the observer were of this type. Approximately 90% of the detections in this and previous studies of *L. j. coturniculus* were "growl calls" (*grr*) in response to broadcast tapes, and it is not likely that these agitated "scolding" vocalizations represent only territorial males (PRBO unpubl. data, Eddleman et al. 1994, Legare et al. 1999). The broadcasts may well elicit responses from nesting females. Indeed, in reference to *L. j. coturniculus*, Flores and Eddleman (1993) state that "scolding occurs in response to disturbance while female is displaying near nest site." Because of these uncertainties we can not say whether our values represent just territorial males or some fraction of the total number of breeding adults of either sex. The findings of Legare et al. (1999), with *L. j. jamaicensis* in Florida indicated that on average only 50% of males and 20% of females responded.

(5) Spear et al. (1999) tested the effects of temporal and environmental factors on the probability of detecting California Black Rails and found that they explained 15-20% of the variation in detection probability. Through our methodology we controlled or attempted to control most of those factors (survey timing, tide height, air temperature, wind speed, cloud cover), but we did not consider moon phase.

(6) Finally, this study was a synoptic survey with sites chosen to represent the geographic breadth of tidal marshlands in the northern reaches of the San Francisco Bay area. Therefore, sites were fairly well distributed along varying reaches of watercourses and at representative marsh types (bayshore, river or slough shore, river mouth). However, there was probably some bias because certain sites were more accessible than others. Higher marshes are more easily accessed by observers and although all stations were above mean high water, stations were probably located within the higher portions of the available elevational gradient. Although we attempted to use straight transects, observers often had to modify their route because large sloughs impeded movement toward the lower marsh plain where sloughs widen.

ABUNDANCE ESTIMATES AND VARIATION IN ABUNDANCE

Keeping the above caveats in mind, it is clear that it is difficult to precisely estimate Black Rail abundance at this time. Our best estimate based on current methodology is about 14,500 Black Rails in the entire San Francisco Bay system, with a lower-bound estimate of 8,000 Black Rails; however, the true number may be higher or lower, depending on the factors listed above. As estimates of percentages of appropriate habitat and estimates of rail movement in response to tape playback and sex-related frequencies are refined, the confidence of our abundance estimates will improve or require reevaluation.

FACTORS INFLUENCING ABUNDANCE

The apparent increase in total population observed in some regions in this survey could have been related to variation in the hydrologic cycle. The 1988 surveys followed two relatively dry seasons. In contrast, in 1994-95 and 1995-96 rainfall was above normal. Perhaps more importantly, both years preceding this study experienced anomalous spring precipitation (18.1% of the annual rainfall in 1995-96 fell in April and May). It is well-known that rails favor marshes were the substrate is saturated (Eddleman et al. 1994) and the results of this study suggest that marshes that are isolated from tidal influence, or that receive muted tidal flow, may provide Black Rail habitat only in years of high rainfall.

In contrast, outer coast marsh abundance indices showed a strong tendency to decline,

which is of great concern since abundance values were already lowest in these marshes. The long-term outlook for these marshes is bleak, although a tidal marsh restoration project in Tomales Bay (National Park Service) aims at more than doubling the available outer coast rail habitat in the future.

It is not surprising that abundance patterns (overall difference and differences in time trends) differed between Suisun and San Pablo bays, because these bay regions are somewhat dissimilar (Goals Project 1999). The Suisun system is less saline than San Pablo and Black Rails prefer some freshwater influence both among and within marshes (Evens et al. 1991, Eddleman et al. 1994). In addition, predator pressure likely differs among regions, with the less urbanized Suisun Bay supporting a different complex of mesopredators than the more urbanized San Pablo Bay. Another factor influencing Black Rail abundance (for which we have little information) is diversity of habitat relative to tidal level on a micro-scale. Low elevation areas are susceptible to inundation, increased predation (Evens and Page 1986) and nest loss (Eddleman et al. 1994).

RELATIONSHIPS BETWEEN RAIL PRESENCE, ABUNDANCE AND HABITAT VARIABLES

In an earlier study, vegetation height, presence of *Frankenia* (an indicator of high elevation marsh habitat), and absence of amphipods (indicators of lower elevation marsh) were identified as key predictive factors in Black Rail distribution (PRBO unpubl. data). Observational data suggests also that the condition of transitional vegetation along the upland edge adjacent to marshes is a factor in habitat suitability for rails (Evens and Page 1986). Subsequent field work, including this study, has suggested other variables that help explain the patchy distribution of San Francisco Bay region tidal marshes (Flores and Eddleman 1993, Evens et al. 1991): marsh size, marsh distribution (contiguity), marsh configuration (linear vs broad), predator populations, hydrological cycles, and fluctuations in water level.

1) Size. This study indicates that marsh size may be positively correlated to an increase in rail abundance. Smaller marshes are less likely to support rails and there is a non-significant but positive tendency for abundance and density to increase with marsh size. This tendency is exhibited in each region. That said, it is important to recognize that Black Rails can utilize very small patches, especially in areas where large patches are unavailable (Aigner et al. 1995, Tecklin 1999, J. Tecklin pers. comm..).

2) Contiguity. We did not systematically evaluate the contiguity of marshes in San Francisco Bay, however, it is likely that the distributional relationship of each marsh to other marshes influences presence or absence as well as relative abundance of rails. At some sites (e.g. Rush Creek/Black John Slough), we observed occupation by rails of marshes with muted tidal flow if they were adjacent to a fully-tidal marsh and the substrate was hydrated (i.e. in a wet year), but not flooded.

The Rallidae in general disperse effectively (del Hoyo et al. 1996) and the apparent colonization of several disparate and isolated sites in California in recent years (Evens et al. 1991, Aigner et al. 1995, Tecklin 1999, J. Tecklin pers. comm.) suggests that this is the case for Black Rails as well. In addition, the most isolated marsh within the San Francisco Bay system — Southhampton Marsh in the Carquinez Strait — supports an apparently persistent population (at least since 1988 — authors, pers. obs.). From a rail's perspective, the marshes of San Francisco Bay are perhaps all contiguous.

3) Configuration. Although for the purposes of this study we did not quantify linearity versus breadth of each marsh, we have observed that broader marshes tend to support rails (and in higher abundances) than linear marshes. Thus, rails are very sparsely distributed along the narrow strip marshes that fringe many of the larger watercourses in San Francisco Bay (e.g. Napa River) but tend to be concentrated in broader patches. This pattern is perhaps a manifestation of what is generally displayed in the area relationships, i.e. a function of ratio of edge to 'center,' as well as the geophysical effect of elevational gradients being compressed in linear habitats (i.e. along tidal sloughs) and, therefore, less elevational gradient is available. (In an intensive study of Sonoma Creek Marsh, in 1987, we documented distribution within a linear marsh that mirrored the microelevational changes within the marsh; authors, unpubl. data).

4) Predator populations. Sites bound by levees or rip rap provide access and habitat to mammalian predators and, therefore, predation pressure may increase at those sites, especially when peripheral vegetation does not provide refuge. Some sites are crossed by boardwalks or pathways, increasing vulnerability of resident rails to these predators. Predator populations also vary among regions within the San Francisco Bay area.

5) Hydrology. As described in an earlier study (Evens et al. 1991), within the San Francisco Bay region tidal marshes that are subjected to fully tidal influence provide the best habitat for Black Rails. Within those marshes, particularly in younger sites or those sites that have suffered extensive hydrological modification by humans (mosquito ditching, etc.), the rails may be clustered near sources of fresh water influence as indicated by "*Scirpus* islands." These habitat features are not necessarily natural and may have become established as the result of drainage modification, e.g. culvert outflows. This pattern of distribution (evident at China Camp, Mare Island, and several other sites) mirrors the situation as described at some sites in the Sierra foothills (Tecklin 1999) and along the Colorado River and Imperial Canal (Repking and Ohmart 1977, PRBO unpubl. data), sites at which rails are associated with freshwater leaks in water transport systems.

6) Water levels. Fluctuation of water levels is one of the habitat variables that determines presence or absence of Black Rails (Flores and Eddleman 1991, Evens et al. 1991, J. Tecklin pers. comm.). Inundation above a certain depth may exclude habitat to Black Rails; if the inundation is periodic and short-lived (e.g. tidal), and there is upland refugia adjacent to the marsh, rails may persist at the site.

ACKNOWLEDGEMENTS

The studies reported herein were supported by grants from California Department of Fish and Game and the National Biological Service (now United States Geological Survey, Biological Resources Division). Support was also provided by U.S. Fish and Wildlife Service, California Department of Parks and Recreation, Hayward Regional Shoreline, Solano County Open Space District, Marin County Open Space District, and Point Reyes Bird Observatory. Field work was conducted by N. Christy, L. Feeney, T. Gardali, G. Grace, P. Henderson, E. Hutchinson, R. Leong, T. Nordbye, G. Page, R. Stallcup, D. Sierra, N. Warnock, S. Warnock, and D. Whimpfheimer. Reviews of earlier drafts and critical comments were provided by D. Ainley, T. Manolis, G. Page, L. Spear, L. Stenzel, J. Tecklin, and S. Zack.

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PRODUCTIVITY AND SURVIVAL OF THE LOGGERHEAD SHRIKE IN INDIANA[1]

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Abstract. We estimated productivity and adult survival of the Loggerhead Shrike *(Lanius ludovicianus)* in Indiana during 1988 and 1989. Productivity averaged 3.82 fledglings/pair and adult survival was 52% based on observed band-return and site-fidelity rates. These numbers predict a mean lifetime reproductive output of 4.08 young per breeding individual, requiring a juvenile survival rate of 24% for replacement. Although the number of breeding pairs in our core study area remained constant, Breeding Bird Survey data and recent surveys indicate that the population is declining.
Key words: Loggerhead Shrike, *Lanius ludovicianus*, Indiana, productivity, survival probability.

PRODUCTIVIDAD Y SOBREVIVENCIA DEL ALCAUDÓN AMERICANO (LANIUS LUDOVICIANUS) EN INDIANA.

Resumen. Estimamos la productividad y sobrevivencia adulta del alcaudón americano en Indiana en 1988 y 1989. La productividad promedio fue de 3.82 pollos/pareja y la sobrevivencia adulta fue del 52% según recuperaciones de anillos y tasas de fidelidad de sitio. Estos números predicen una capacidad reproductiva vitalicia de 4.08 pollos por individuo reproductor, lo cual requiere una tasa de sobrevivencia juvenil de 24% para alcanzar el remplazo. Aunque el número de parejas nidificantes en nuestra área de estudio permaneció constante, datos del Breeding Bird Survey y conteos recientes indican que la población está en declive.
Palabras clave: Alcaudón americano, *Lanius ludovicianus*, Indiana, productividad, probabilidad de sobrevivencia.

PRODUCTIVITE ET SURVIE DE LA PIE-GRIECHE MIGRATRICE DANS L'INDIANA

Résumé. Nous avons estimé la productivité et la survie adulte de la Pie-grièche migratrice *(Lanius ludovicianus)* dans l'Indiana en 1988 et 1989. La productivité moyenne était de 3.82 poussins à l'envol par couple, et la survie adulte était de 52% sur la base des retours de bagues observés et des taux de fidélité au site. D'après ces chiffres on prédit la production de 4.08 jeunes en moyenne par chaque adulte reproducteur au cours de sa vie, avec un taux de survie juvénile de 24% pour assurer le remplacement. Bien que le nombre de couples reproducteurs reste constant au cœur de notre site d'étude, les données du Breeding Bird Survey et les derniers recensements indiquent que la population est en déclin.
Mots-clés: Pie-grièche migratrice, *Lanius ludovicianus*, Indiana, productivité, probabilité de survie.

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PRODUKTIVITÄT UND ÜBERLEBENSRATE
VON LOUISIANAWÜRGERN IN INDIANA

Zusammenfassung. Wir berechneten Produktivität und Adult-Überlebensrate beim Louisianawürger *(Lanius ludovicianus)* in Indiana für 1988 und 1989. Produktivität war im Mittel 3.82 flügge Junge/BP und Adult-Überlebensrate auf Basis von Wiederfunden und Rückkehrraten entsprach 52%. Aus den Zahlen ergibt sich eine mittlere Lebens-Reproduktion von 4.08 Jungvögeln pro brütendem Individuum, was wiederum eine Überlebensrate von 24 % bei den Jungvögeln voraussetzt, um den Verlust der Altvögel zu kompensieren. Obwohl die Zahl der Brutpaare in unserem Hauptuntersuchungsgebiet unverändert blieb, legen Monitoringdaten aus dem BBS und jüngste Bestanderfassungen nahe, dass die Population abnimmt.

Schlüsselwörter: Louisianawürger, *Lanius ludovicianus,* Indiana, Produktivität, Überlebenswahrscheinlichkeit.

INTRODUCTION

The Loggerhead Shrike (*Lanius ludovicianus*) has exhibited a well-documented but poorly-understood decline over much of its range during this century (Morrison 1981, Peterjohn and Sauer 1995, Cade and Woods 1997). The Breeding Bird Survey (BBS) shows a 3.69% annual decline, one of the strongest of any species, survey-wide from 1966 to 1998 (Sauer et al. 1999). Suggested causes of declines most commonly include loss of nesting habitat (Graber et al. 1973, Smith and Kruse 1992), high pesticide loads (Busbee 1977, Anderson and Duzan 1978, Blumton et al. 1990) and high winter mortality due to habitat loss in turn producing increased intraspecific competition (Brooks and Temple 1990a, Lymn and Temple 1991, Telfer 1993). Other potential factors include road mortality (Bull 1974, Novak 1986, Flickinger 1995), disease (LeGrand 1985), interspecific competition (Novak 1986), predation (Scott and Morrison 1990), and reduced productivity (Yosef 1994). However, no single factor satisfactorily accounts for these declines (Bystrak 1983, Hanrahan 1987).

Declines in populations are evident among shrike species world-wide. Recent and drastic declines and range contractions have been documented for every well-studied shrike species (Yosef and Lohrer 1995). These trends prompted the First International Shrike Symposium in 1993; this symposium highlighted the consistency of population trends, the scarcity of good demographic data, and the need for further study.

It is generally recognized that critical data on productivity and survivorship are essential for identifying not only causes of population declines but also effective management and conservation strategies (DeSante et al. 1993, Martin et al. 1995). Unfortunately, demographic data on shrikes are scarce. Mostly predatory birds of open country, shrikes do not lend themselves well to standardized mark-recapture studies such as the Monitoring Avian Productivity and Survivorship (MAPS) Program. In fact, no systematic study of survivorship in the Loggerhead Shrike, perhaps the most intensively-studied shrike species, has been done. The few existing estimates of survivorship, based on band returns or site reoccupancy, are confounded by unknown degrees of dispersal and philopatry (Yosef 1996).

In this paper we present data on the demographics of Indiana's remnant Loggerhead Shrike population on the basis of an intensive two-year study, 1988-1989. We estimated productivity in each year. We also estimated adult survival probability as a function of band-return rate and site fidelity. We used these results to estimate lifetime reproductive output and the juvenile survival probability necessary for population maintenance. We examine potential sources of error for consideration in future studies.

STUDY AREA

The 151 active Loggerhead Shrike territories found in Indiana during 1988 and 1989 were clustered in 12 southern counties and concen-

trated in the southwest (Figure 1). All sites fell within the Highland Rim and Lexington Plain physiographic regions (Bystrak 1981). The area is primarily open farmland interspersed with woodlots of various sizes. The terrain ranges from relatively flat bottomlands in the west to hilly, more heavily wooded country in the east. Many of the territories were in Amish settlements, which appear to provide habitat conditions especially attractive to shrikes (Burton 1989, 1990).

METHODS

PER-PAIR PRODUCTIVITY

To measure productivity, we included only territories found early in the season (before first broods fledged). In 1988, we visited all active shrike territories weekly from time of discovery through August or until we sighted no birds during two consecutive visits. We checked nest contents on every visit until fledging or failure and collected data on fledging rates. In 1989, we visited territories every four days and checked nests as in 1988.

ADULT SURVIVAL PROBABILITY

We caught 37 adult shrikes (22 males and 19 females) from breeding pairs in 1988 and banded them with unique combinations of one aluminum band on one leg and two coiled, plastic color bands on the other. In 1989, we revisited all sites active in 1988 to determine site re-occupancy (the proportion of 1988 territories active in 1989) and site fidelity (the proportion of returning adults using the same territory in both years). We searched the study area for additional territories not found in 1988. We calculated band-return rates as the proportion of banded birds of each sex found in 1989. From these data we estimated adult survival probability from 1988-1989 as

$$ASP = BR/SF,$$

where ASP = adult survival probability, BR = band-return rate, and SF = site fidelity. This model is based on the assumptions that we found all the returning birds and that surviving birds were as likely to switch territories as they were to leave the study area.

POPULATION CHANGE

In both years we counted the number of shrike pairs within our intensively monitored core

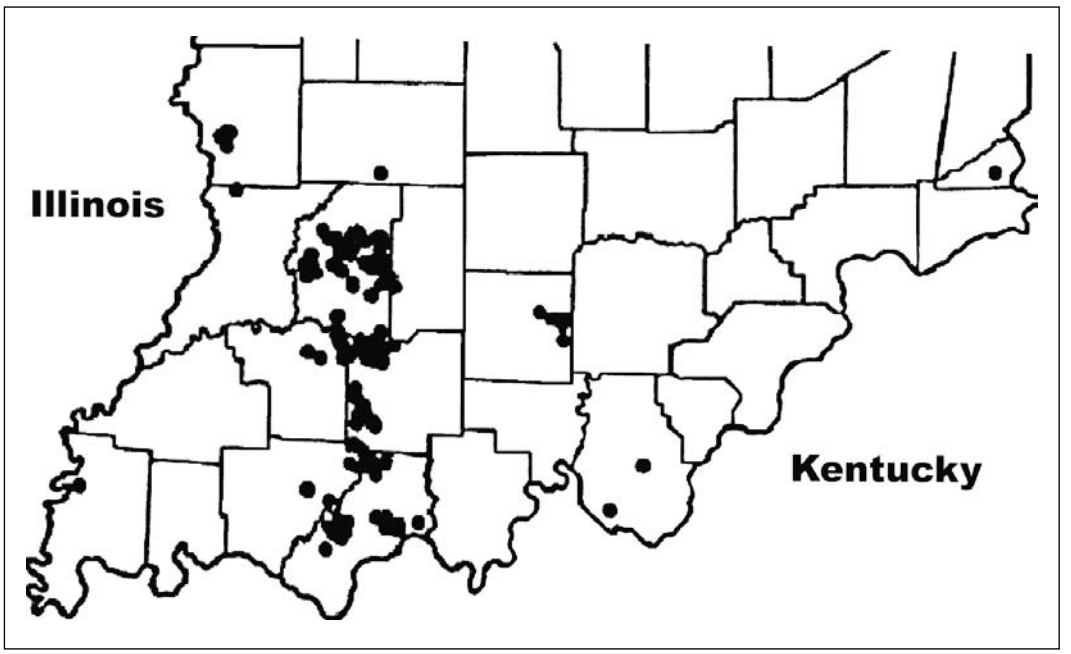

FIGURE 1. Known Loggerhead Shrike nest sites in Indiana, 1988-89.

study area to estimate the two-year local population change. At the beginning of the 1989 breeding season, we checked all known 1988 territories in this area at least twice. Intervening areas were traversed and scanned every week in 1988 and every four days in 1989.

Results are expressed as mean ± SE. Statistical significance was set at $\alpha = 0.05$.

RESULTS

PRODUCTIVITY

Nesting pairs (n = 55) produced an average of 3.82 ± 2.76 fledglings during the two years of study [3.12 ± 2.50 (n = 17) in 1988 and 4.13 ± 2.87 (n = 38) in 1989; Table 1].

ADULT SURVIVAL

During 1989, 38 of 54 nesting territories found in 1988 were active again; thus, site re-occupancy was 0.704 (Table 1). Eleven of 12 returning banded males and 3 of 5 returning banded females used the same territories in both years; thus, *BR* was 0.545 for males and 0.263 for females and *SF* was 0.917 for males and 0.600 for females (Table 1). This resulted in *ASP* values of 0.594 for males and 0.438 for females ($\bar{x}$ = 0.516).

POPULATION CHANGE

The number of breeding pairs in our core study area remained constant at 17 from 1988 to 1989, indicating no change in the size of the population. Site re-occupancy in this area was identical to that for the entire study area, indicating that the core was representative of the whole.

DISCUSSION

PRODUCTIVITY

We probably underestimated productivity slightly because our 1988 sample was biased heavily towards a subset of the population (birds in Amish areas) that had lower productivity than the remainder (Burton 1990). Nonetheless, our estimate of 3.82 ± 2.76 is similar to the mean value of 3.46 ± 0.69 reported in studies of Loggerhead Shrikes summarized by Luukkonen (1987) and is probably above average for open-nesting, temperate-zone passerines (Nolan 1978, Kridelbaugh 1983, Brooks and Temple 1990b).

Other authors (Kridelbaugh 1983, Gawlik and Bildstein 1990) have concluded that productivity of Loggerhead Shrikes remains relatively high,

Table 1. Demographic parameters of the Loggerhead Shrike in Indiana. Sample sizes in parentheses.

Parameter	1988	1989	Both years
Per-pair productivity[1]	3.12 ± 2.50 (17)	4.13 ± 2.87 (38)	3.82 ± 2.76 (55)
Site re-occupancy		0.704 (54)	
Adult band returns		0.415 (41)	
Adult band returns (♂)		0.545 (22)	
Adult band returns (♀)		0.263 (19)	
Adult philopatry		0.824 (17)	
Adult philopatry (♂)		0.917 (12)	
Adult philopatry (♀)		0.600 (5)	
Adult survival		0.516	
Adult survival (♂)		0.594	
Adult survival (♀)		0.438	
Breeding seasons			2.14
Breeding seasons (♂)			2.39
Breeding seasons (♀)			1.89
Lifetime productivity			4.08
Lifetime productivity (♂)			4.56
Lifetime productivity (♀)			3.61

[1]Expressed as mean ± SE.

even in declining populations. None of 18 studies summarized by Cade and Woods (1997) suggested reduced productivity as a cause of population declines in this species, although Novak (1989) and Yosef (1994) suggest that it may be premature to discount productivity. Unfortunately, too little information is available on productivity in the few increasing Loggerhead Shrike populations to allow comparison with decreasing populations. The fact that shrike productivity is higher than that of some other species does not mean that it has not declined, nor that a reduction is not contributing to population declines.

ADULT SURVIVAL

Previous estimates of survivorship in Loggerhead Shrikes have been confounded by unknown degrees of philopatry (Yosef 1996). Brooks and Temple (1990b) used site re-occupancy (0.47) as a direct measure of adult survival based on the assumptions of 100% male site fidelity, equal survival rates of males and females, an unskewed sex ratio, and unlimited breeding opportunities for all survivors. However, neither males nor females in Indiana exhibited 100% philopatry. Moreover, we found evidence of a sizeable number of male floaters, suggesting a skewed sex ratio, perhaps resulting from unequal survival rates. Furthermore, site re-occupancy is affected by other factors such as habitat quality and availability as well as recruitment. Thus, we feel that the degree of site re-occupancy is not a valid direct measure of adult survival.

Band-return rates, particularly of females, may underestimate adult survival. Haas and Sloane (1989) suggested that low band-return rates for shrikes may indicate low site fidelity rather than winter mortality. Our site-reoccupancy rate of 70% was substantially higher than our band-return rates of 55% for males and 26% for females. Kridelbaugh (1983) recorded a site-reoccupancy rate of 54% and a male return rate of 47%, while Brooks and Temple (1990b) recorded rates of 47% and 43%, respectively. None of Kridelbaugh's (1983) banded females returned to his study area, and Haas and Sloane (1989) reported a five-fold bias towards male band returns in North Dakota. Our data indicate that these wide disparities between male and female return rates are due in part to a greater degree of philopatry by males.

Other than the estimate of adult survival by Brooks and Temple (1990b), based purely on site reoccupancy, we know of no direct estimates of adult survival in shrikes. Ricklefs (1973) reported adult survival rates ranging from 0.29-0.63 for other passerines, depending on body size. DeSante et al. (1998) reported survival probabilities of 0.47-0.66 for Wood Thrush (Hylocichla mustelina), 0.49-0.61 for Gray Catbird *(Dumetella carolinensis)*, and 0.55-0.74 for Northern Cardinal *(Cardinalis cardinalis)*, depending on region, based on MAPS data. DeSante et al. (1999) found that adult survival probability of about 0.55 or greater predicted a population increase in a passerine community in the Pacific Northwest. In the context of these data, we suggest that the little evidence available on Loggerhead Shrikes indicates low adult survival as contributing to population declines.

The apparent discrepancy we observed between male and female survival could be an indicator of intraspecific competition on the wintering grounds resulting from habitat loss (see also Brooks and Temple 1990a, Lymn and Temple 1991, Telfer 1993). Such competition likely would favor adult males over other age and sex classes. Alternatively, our assumption that birds were as likely to switch territories within the study area as they were to leave the study area may not be valid for females, which may have lower philopatry and higher survival than we estimated.

LIFETIME REPRODUCTIVE OUTPUT AND JUVENILE SURVIVAL

With a mean annual reproductive output of 3.82 young per pair and a mean annual survival probability of 0.516, the mean reproductive lifespan of shrikes in Indiana is 2.14 breeding seasons and the mean lifetime reproductive output is 4.08 young per individual. The survival rate to breeding age of these offspring would need to be 0.245 (47% that of their parents) to maintain a stable population in the absence of net migration. This juvenal survival rate seems reasonable. Dhondt (1979) recorded a juvenal survival rate of 0.1 for a population of Great Tit *(Parus major)*, a small, sedentary species. Brooks and Temple (1990b) arrived at an estimate of 0.19 for a strongly declining

Loggerhead Shrike population. Ash (1970) calculated a rate of 0.32 for Red-backed Shrike *(Lanius collurio)*. Ricklefs (1973) states that theoretical juvenal passerine survival is about 0.3 and that the ratio of juvenal:adult survival is typically about 0.25 for passerines. Other recent studies indicate that this ratio probably ranges from 0.25-0.50 (DeSante et al. 1999).

Recent studies also have shown that most juvenile passerines do not survive the period between fledging and dispersal (Sullivan 1989, Zann and Runciman 1994, Anders et al. 1997). Our observations suggest that fledgling mortality in our study population during the first two weeks was quite high, perhaps exceeding 40%, and the period of post-fledging dependency extends well beyond that time. In fact, this period of vulnerability may be longer in shrikes than in other passerines, perhaps even approaching that of some raptors, because shrikes must acquire relatively complex hunting skills. It may be lengthened even further by mental retardation caused by contaminant loads (Busbee 1977).

POPULATION CHANGE

The shrike population in our core study area did not decline from 1988 to 1989. However, intensive surveys in two portions of our study area (including the core) in 1999 and 2000 indicated that the shrike breeding population had declined by 41% since our study (Castrale and Ferchak 2001). The decline was only 13% (from 39 territories to 34) in the portion including our core area but 60% (from 58 territories to 23) in the other, suggesting that the shrike population in Indiana may be a heterogeneous assemblage of independent clusters and that conclusions drawn from one may not be applicable to others. The Breeding Bird Survey shows a highly significant, 15% annual decline in the combined Highland Rim and Lexington Plain strata from 1988 to 1998 (Sauer et al. 1999). Thus, the shrike population in the middle Ohio Valley appears to be declining sharply, and the apparent stability we observed during 1988-1989 may have been a spatial and/or temporal anomaly. We suspect that survival during the 1988-89 winter may have been unusually high due to mild, dry weather to the south (Muth 1989, Peterjohn 1989) and that the population in our core study area is declining less precipitously than elsewhere in the state.

Evidence available from Indiana supports the conclusions of other researchers that Loggerhead Shrike declines may be due more to low survival rates of adults and young, especially away from the breeding grounds, than to poor productivity or breeding habitat loss. To confirm or refute this hypothesis, rigorous comparative demographic studies of increasing, stable, and decreasing shrike populations on the breeding grounds are desperately needed, coupled with studies of over-winter survival of young and adult shrikes. Such studies are complicated by the difficulty of identifying and defining populations and by the considerable mixing of populations and subspecies that occurs on the wintering grounds. Demographic studies (of all species) need to be combined with standardized censuses to assess population trend within the study area itself rather than relying on BBS data, which often show considerable heterogeneity within physiographic regions and trends that are seldom associated with physiographic boundaries (Sauer et al. 1995).

ACKNOWLEDGMENTS

We are indebted to the many landowners throughout Indiana who allowed access to their property. J. Bonnell and M. Schooley conducted much of the field work. We thank the staff of the Department of Biology, Indiana University, for their technical support. R. Chandler, D. Cristol, D. DeSante, V. Nolan, Jr., P. Nott, D. Plumpton, D. Willard, and several anonymous reviewers critiqued earlier versions of the paper. This study was conceived by G. Iverson and funded by the U.S. Fish and Wildlife Service and the Indiana Dept. of Natural Resources.

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TRENDS IN MIDWINTER COUNTS OF BALD EAGLES IN THE CONTIGUOUS UNITED STATES, 1986-2000[1]

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Abstract. We estimated statewide, regional, and national trends in counts of Bald Eagles (*Haliaeetus leucocephalus*) along selected routes in the contiguous United States during midwinter, 1986-2000. Each January, several hundred observers collected data as part of a survey initiated by the National Wildlife Federation in 1979. To analyze these data, we used only those routes surveyed consistently in at least four years and on which at least four eagles were counted in a single year. We included surveys conducted during fog or precipitation after determining that changes in weather conditions probably did not affect trend estimates. Our final analysis, using a hierarchical mixed model, was based on 101,777 eagle sightings during 5,180 surveys of 563 routes in 42 states. In the model, fixed effects were year, region, and route-length category; the random effect was the route itself. Model-based estimates of Bald Eagle counts throughout the U.S. increased 1.9% yr^{-1}, but trend estimates varied by region. Estimated trends were statistically significant, and positive, in the northeastern U.S. (6.1% yr^{-1}), but were not significant in other regions. The proportion of increasing counts was higher north of 40º N and east of 100º W. Trends in numbers of adults and immatures showed similar geographic patterns, but counts of adults increased at a higher rate. Overall, trends were more similar to those identified by the Christmas Bird Count than the Breeding Bird Survey. In spite of limitations, the survey is a cost-effective way to monitor wintering eagles in the lower 48 states. We discuss estimated trends in the context of increased urbanization, changed weather, and recovery from pesticide pollution.

Key Words: Bald Eagle, *Haliaeetus leucocephalus*, regional trends, wintering populations

[1]Received: 15 July 2002. Accepted: 16 September 2002.

TENDENCIAS EN CONTEOS INVERNALES DE ÁGUILAS CALVAS EN LOS ESTADOS UNIDOS CONTIGUOS, 1986-2000.

Resumen. Estimamos tendencias en los conteos estatales, regionales y nacionales de águila calva (*Haliaeetus leucocephalus*) a lo largo de rutas selectas en los Estados Unidos contiguos durante el invierno, desde 1986 a 2000. Cada mes de enero, varios cientos de observadores colectaron datos como parte de un conteo iniciado por la National Wildlife Federation en 1979. Para analizar estos datos, utilizamos solamente las rutas muestreadas regularmente durante al menos cuatro años y en las que se contabilizaron al menos cuatro águilas en un solo año. Incluimos los conteos realizados en condiciones de niebla o lluvia tras determinar que los cambios meteorológicos no parecen afectar las estimas. Nuestro análisis final, utilizando un modelo jerárquico mixto, se basó en 101.777 avistamientos de águilas durante 5180 muestreos de 563 rutas en 42 estados. En el modelo, los efectos fijos fueron año, región, y categoría de longitud de ruta; el efecto aleatorio fue la ruta en sí. Las estimas de conteos de las águilas en todo EE.UU. aumentó 1.9% por año, pero las tendencias variaron por región. Las tendencias fueron estadísticamente significativas y positivas en el noreste de EE.UU. (6.1% yr^{-1}), pero no fueron significativos en otras regiones. La proporción de conteos en aumento fue más alta al norte de 40º N y al este de 100º N. Las tendencias en números de adultos e inmaduros mostraron patrones geográficos similares, pero los conteos de adultos mostraron una tasa de aumento más alta. En general, las tendencias fueron más similares a las detectadas por el Christmas Bird Count que las del Breeding Bird Survey. A pesar de las limitantes, el muestreo es un método de bajo costo para monitorear las águilas calvas invernantes en los 48 estados contiguos. Discutimos las tendencias estimadas en el contexto del aumento de la urbanización, cambios meteorológicos, y recuperación de contaminación por pesticidas.

Palabras clave: Aguila calva, *Haliaeetus leucocephalus*, tendencias regionales, poblaciones invernantes.

EVOLUTION DES EFFECTIFS DE PYGARGUES A TETE BLANCHE DENOMBRES EN MILIEU D'HIVER DANS LES ETATS-UNIS CONTIGUS, 1986-2000.

Résumé. Nous avons estimé de 1986 à 2000 la tendance des effectifs de Pygargues à tête blanche *(Haliaeetus leucocephalus)* en milieu d'hiver, à l'échelle de la région, de l'état et du pays, le long de transects sélectionnés dans les Etats-Unis contigus. Lors de chaque mois de Janvier, plusieurs centaines d'observateurs ont récolté des données dans le cadre du recensement initié par la National Wildlife Federation en 1979. Pour analyser ces données, nous n'avons utilisé que les transects parcourus régulièrement au cours des quatre dernières années, et sur lesquels au moins quatre pygargues ont été comptés chaque année. Nous avons inclus les recensements ayant eu lieu par temps de brouillard ou durant des précipitations, après avoir déterminé que les conditions météorologiques n'affectaient probablement pas les estimations de tendances. Notre analyse finale, par un un modèle mixte hiérarchique, était basée sur 101,777 observations de pygargues, provenant de 5,180 recensements sur 563 transects, dans 42 états. Dans le modèle, les effets fixes étaient l'année, la région, et la catégorie de longueur du transect ; l'effet aléatoire était le transect lui-même. Les estimations du nombre de Pygargues à tête blanche aux Etats-Unis augmentaient de 1.9% par an, mais avec une variation entre régions. Les tendances estimées étaient statistiquement significatives, et positives, dans le nord-est des Etats-Unis (6.1% par an), mais non significatives dans les autres régions. La proportion d'effectifs en croissance était plus élevée au nord du 40° N et à l'est du 100° W. Les tendance des effectifs d'adultes et d'immatures montraient des patterns géographiques similaires, mais l'augmentation du nombres d'adultes comptés était plus rapide. Globalement, les tendances d'évolution étaient plus proches de celles identifiées par le Christmas Bird Count que par le Breeding Bird Survey. En dépit des limitations, le recensement est un moyen rentable de suivre les populations de pygargues hivernant dans les Etats-Unis contigus. Nous discutons ces tendances estimées dans le contexte de l'urbanisation croissante, des modifications des conditions météorologiques, et de la réduction de la pollution par les pesticides.

Mots-clés: Pygargue à tête blanche, *Haliaeetus leucocephalus*, tendances régionales, populations hivernantes

BESTANDSTRENDS BEI FLÄCHENHAFTEN MITTWINTERZÄHLUNGEN
DES WEIßKOPFSEEADLERS IN DEN USA 1986-2000

Zusammenfassung. Die Arbeit fasst die Bestandsentwicklung des Weißkopfseeadlers *(Haliaeetus leucocephalus)* nach Zählungen auf ausgewählten Zählstrecken über die gesamte USA während der Mittwinter 1986-2000 für Einzelstaaten, Großregionen und die USA zusammen. In dem von der National Wildlife Federation 1979 initiierten Programm wurde in jedem Januar der Adlerbestand von mehreren hundert Mitarbeitern erfasst. Bei der Auswertung wurden aber nur Zählstrecken berücksichtigt, die in mindestens 4 aufeinanderfolgenden Wintern bearbeitet wurden und die eine Mindestzahl von 4 Seeadlern aufwiesen. Mit einbezogen wurden Zählungen bei Nebel oder Starkregen, wenn ersichtlich war, dass die Bestandsberechnungen von Wetteränderungen nicht beeinträchtigt wurden. Die Analyse mit Hilfe eines hierarchischen Misch-Modells basiert auf 101,777 Adlerbeobachtungen bei 5,180 Beobachtungsgängen auf 563 Zählstrecken in 42 Staaten. Im Berechnungsmodell waren Jahr Region und Streckenlänge die unabhängigen Variablen, die, Zählstrecke selbst die abhängige. Die Modellberechnungen der Adlerbestände ergaben für die gesamte USA eine Zunahme um 1.9% pro Jahr, wobei sich die Bestandentwicklung für die Regionen unterschied. Im NE waren die Bestandstrends statistisch signifikant positiv (Zunahme um 6.1%/Jahr), für die anderen Regionen nicht. Die Anzahl der Zählstrecken mit Bestandszunahmen nahm nördlich 40° N und östlich 100° W deutlich zu. Die Trends für Altvögel und Immature wiesen ähnliche geographische Muster auf, wobei die Zunahmen bei Altvögeln ausgeprägter waren. Generell stimmen die Ergebnisse besser mit denen des Christmas Bird Count überein als mit dem Brutvogel-Monitoringprogramm BBS. Trotz mancher Einschränkungen handelt es sich um ein sehr kosteneffektives Programm zur Erfassung überwinternder Weißkopfseeadler in 48 südlichen, kontinentalen Staaten der USA. Wir diskutieren die Trendangaben im Zusammenhang mit zunehmender Urbanisierung, Klimaveränderungen und der Erholung von Pestizidbelastungen.

Schlüsselworte: Weißkopfseeadler, *Haliaeetus leucocephalus,* regionale Trends, Winterbestände.

INTRODUCTION

Listing of the Bald Eagle *(Haliaeetus leucocephalus)* as "Threatened and Endangered" under the Endangered Species Act in 1978 prompted numerous efforts to monitor populations in both nesting and wintering areas. The National Wildlife Federation began sponsoring midwinter surveys of Bald Eagles in 1979. Initial objectives were to determine eagle distribution during winter, identify previously unrecognized areas of important winter habitat, and estimate the wintering Bald Eagle population in the lower 48 states. Total counts of eagles during midwinter surveys increased each year from 1979 through 1982 (Millsap 1986), but unequal survey effort among years prevented a meaningful analysis of population trends at that time.

Beginning in 1984, National Wildlife Federation officials asked participants in each state to count eagles along standard, non-overlapping routes to provide data on winter trends in Bald Eagle populations. Federation guidelines stipulated that standard surveys be conducted by the same number of experienced observers using the same method (e.g., fixed-wing aircraft, helicopter, boat, vehicle) at approximately the same time of day each year in well-defined areas where eagles had been observed in prior winters. In this paper, we use data from counts conducted along standard routes from 1986 through 2000 to estimate national and regional count trends, overall and by age class.

METHODS

DATA COLLECTION

Each year, observers conducted surveys on standard routes during the first two weeks of January, usually on one of two target days. Coordinators in each state were responsible for organizing local surveys, enlisting participants,

and verifying survey route consistency. Most survey participants were employees of state or federal conservation agencies, but private citizens also participated in the surveys as volunteers. Observers classified >97% of eagles seen as either adult (white head and tail) or immature (brown head and tail).

Due to weather and staffing limitations, not all standard routes were surveyed every year. Twenty-seven states identified and began surveying standard routes in 1986, but others did not begin standard surveys until the mid-1990s. Some states discontinued surveys in the 1990s.

More than 60% of surveys used in the analysis were conducted exclusively from the ground; 44% involved road vehicles. At least 10% involved boats, and almost 30% involved aircraft, both fixed wing and helicopter. Almost 20% of surveys used a combination of methods—mostly vehicle and foot. Most routes were surveyed in a single day, but a small proportion of surveys (< 4%) were conducted on more than one day when weather or logistical problems interfered with counts.

DATA SCREENING

We received more than 10,000 reports of surveys conducted between 1986 and 2000, but were able to use only about half of them for a variety of reasons. We did not use surveys if: (1) the count was conducted before 1 Jan or after 25 Jan; (2) the route covered was inconsistent from year to year or the route was not described clearly enough to determine if it was the same as in other years; (3) the survey method was not listed; or (4) we were unable to obtain information on length of the survey route. We used survey results only if the transportation type (air, ground, water) was consistent because the number of eagles visible from air, ground, or water usually differs significantly (Kaltenecker 1997, Anthony et al. 1999, Bowman and Schempf 1999). We tried to verify that route coverage was consistent from year to year, and we corrected or eliminated records when we became aware of cases where observers covered areas less than or greater than the defined standard route. Nevertheless, some erroneous records may have been included due to incomplete observer documentation.

We used data from only those routes surveyed consistently in at least four years and on which at least four eagles were counted in at least one year. Routes that never had >3 eagle observations in a single year were considered to be in marginal or unsuitable habitat; including them would have biased trend estimates towards zero. Analysis for both age classes combined was based on 5,180 surveys of 563 routes in 42 states (Fig. 1, Table 1). Our trend estimates for age classes were based on reduced data sets that included only those routes where at least four individuals of the age class (adult or immature) were counted in a single year. Adult count trends were based on 4,104 surveys of 464 routes, and immature count trends were based on 2,991 surveys of 370 routes.

DATA CLASSIFICATION

We assigned routes to one of four regions based on location relative to 100° W and 40° N (Northeast, Southeast, Northwest, Southwest). Lengths of survey routes varied considerably; we classified routes into categories, based on the length of river or shoreline surveyed: 0-17 km (n = 124 routes), 18-56 km (n = 181), 57-120 km (n = 159), and >120 km (n = 112). We then defined routes to be in eagle concentration areas if >15, 50, 80, or 100 eagles were ever counted on routes with the respective length categories (n = 111).

DATA EVALUATION

Differences in detectability rates among years on given routes could affect both the variability and the magnitude of trend estimates. We evaluated the data in two different ways to determine if any changes in detectability during fog or precipitation might have affected trend estimates. Approximately 17% of surveys were conducted during fog and/or precipitation. The percent of surveys conducted during fog/precipitation ranged from 0 - 80% per route; 189 of the 576 routes (33%) had fog and/or precipitation during ≥1 survey year. If fog or precipitation limited visibility of eagles, the variability of counts on a route should be related to the proportion of surveys conducted under such conditions. Therefore, to test whether fog or precipitation may have affected count variation, we compared the percent of years each route was surveyed during fog or precipitation to the route's coefficient of variation (CV) using correlation analysis. We evaluated only

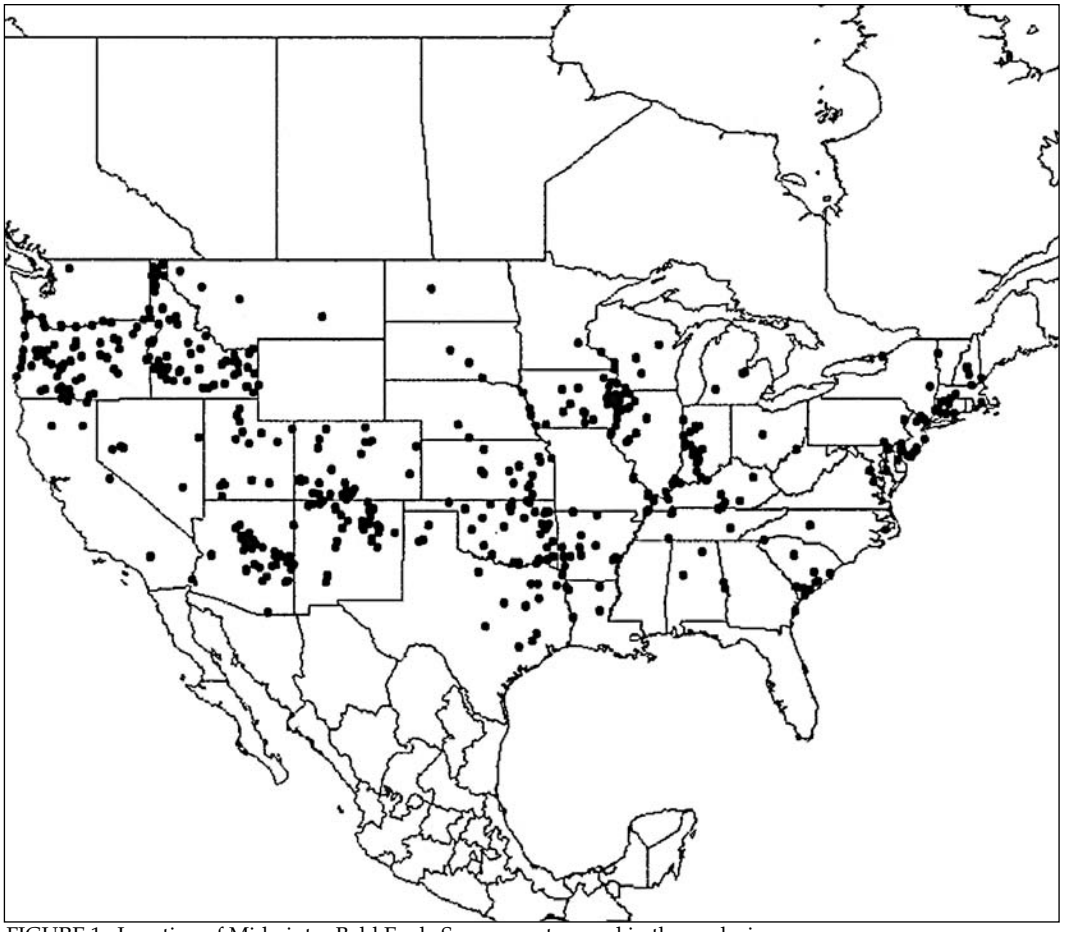

FIGURE 1. Location of Midwinter Bald Eagle Survey routes used in the analysis.

those routes in which ≥50% of surveys were conducted in fog/precipitation (i.e., a high degree of variability in weather) because routes usually surveyed in fog/precipitation might have low but consistent counts. Next, if fog/precipitation limited visibility of eagles consistently enough to systematically bias our analysis, then counts in successive years on the same route with different weather conditions should show a greater difference than counts in successive years when weather conditions were the same. We classified pairs of successive surveys into three groups: those that never had fog/precipitation, those that had fog/precipitation in both years, and those that had fog/precipitation in one survey but not the other. We calculated the absolute difference between logged counts of successive surveys, which is the equivalent of percent change between years. We used a linear mixed model fitting these differences as the dependent variable, group and time as the independent variables, and route as the random effect, to account for possible correlation within routes.

TREND ESTIMATION

To estimate trends, we fit a random coefficients (hierarchical mixed) model. This model estimates a national trend based on fixed effects from all routes and differences between each route's trend and the overall trend (Rutter and Elashoff 1994; McCulloch and Searle 2001). The general form of the model is:

$$Y = X\beta + Z\upsilon + \varepsilon$$

where Y is the logged count; X is the design matrix for fixed effects; β is the coefficient vector

TABLE 1. Number of survey routes and surveys used in the analysis, with estimated trends in the eagles counted, midwinter, by state.

State	Routes	Surveys	Years	Trend
Alabama	3	42	1986-2000	-6.0%
Arizona	51	373	1992-2000	-1.6%
Arkansas	12	86	1986-2000	+0.3%
California	6	51	1986-2000	+3.2%
Colorado	32	312	1986-2000	-1.1%
Connecticut	8	76	1986-2000	+3.2%
Delaware	1	10	1989-1999	+4.5%
Georgia	3	22	1989-2000	-2.9%
Idaho	68	840	1986-2000	+1.9%
Illinois	14	62	1996-2000	+6.6%
Indiana	22	204	1986-2000	+3.3%
Iowa	42	282	1986-2000	+5.6%
Kansas	13	134	1986-2000	+1.5%
Kentucky	13	88	1986-2000	+2.0%
Louisiana	4	28	1986-2000	-2.4%
Maryland	3	40	1986-2000	+5.4%
Massachusetts	4	42	1986-2000	+3.7%
Michigan	3	31	1987-1998	+9.0%
Minnesota	4	49	1986-2000	+7.6%
Montana	4	40	1986-1997	-2.5%
Nebraska	2	29	1986-2000	+5.9%
Nevada	5	25	1992-2000	-2.4%
New Hampshire	4	29	1991-1999	+7.1%
New Jersey	17	165	1988-2000	+4.7%
New Mexico	41	284	1990-1996	-0.3%
New York	2	30	1986-2000	+8.3%
North Carolina	2	14	1987-2000	+0.9%
North Dakota	1	15	1986-2000	-4.4%
Ohio	1	5	1996-2000	+12.3%
Oklahoma	30	277	1986-2000	+0.9%
Oregon	78	801	1988-2000	+1.4%
Pennsylvania	4	35	1986-2000	+1.8%
South Carolina	10	70	1993-2000	+3.3%
South Dakota	4	49	1986-2000	-0.1%
Tennessee	6	86	1986-2000	+2.0%
Texas	19	189	1986-2000	+0.9%
Utah	16	187	1986-2000	+0.1%
Vermont	1	8	1993-2000	+7.3%
Virginia	2	8	1997-2000	+4.5%
Washington	2	27	1986-2000	+4.6%
West Virginia	1	5	1995-2000	+5.4%
Wisconsin	5	30	1991-2000	+0.2%
TOTAL	563	5180		

for fixed effects; Z is the design matrix for random effects; υ is the coefficient vector for random effects; and ε is the overall error. In this model, our fixed effects were year, region, route size category, and whether the route was in a concentration area. The random effect was the route itself.

In estimating the variance of random effects, this model can account for correlation among years within a route. Because migratory Bald Eagles vary in their degree of fidelity to wintering sites (Watson and Pierce 2001), and because this fidelity can be confounded by weather patterns and variations in prey availability,

counts in one year are sometimes but not always related to counts in previous years. Preliminary examination of the data indicated that counts were correlated for four years or more in some regions; in others they correlated only with the preceding year. We, therefore, imposed no structure on the variance-covariance matrix. We initially evaluated a model with all effects and interactions included, and selected our final model by comparing significance levels, model diagnostics, and Akaike's Information Criterion. The model handles missing data, allows assessment of covariates, and produces trend estimates at several scales. Using the final model, we were able to estimate national and regional trends. By combining route-level data, we estimated trends for individual states and for ecoregions, defined by combining Bird Conservation Regions (U.S. NABCI Committee 2000, Table 2). We conducted all analyses using Proc Mixed in SAS version 8 (SAS Institute Inc. 1999).

All averages herein are expressed with plus or minus the standard error.

RESULTS

DATA CHARACTERISTICS

Of the 563 routes used in the analysis, 46 were surveyed in all 15 years, 34 in 13 years, 40 in 12 years, 41 in 11 years, 38 in 10 years, and 316 in <10 years. Surveys spanned the full 15-yr period (1986, 2000, and intervening years) on 114 routes. Counts on most routes showed a high degree of inter-year variability with CVs ranging 7 - 225%; CVs of 18% of routes were >100%. The total number of eagle sightings included in our analysis was 101,777. Number of eagles counted on individual surveys ranged from 0 (n = 441) to 965 (Lower Klamath Basin, 1988).

DATA EVALUATION

Route CVs were not related to the percent of surveys conducted during fog/precipitation (r^2 = –0.051, P = 0.24, n = 549 routes). Absolute percent differences in numbers of eagles seen between successive surveys differed significantly from 0 ($P < 0.001$), but absolute percent differences between successive surveys conducted under different weather conditions were similar to those when weather did not differ ($\chi^2_2 = 5.27$, $P = 0.072$). Absolute percent differences in counts between successive surveys averaged 0.71 ± 0.06 with fog/precipitation, 0.73 ± 0.02 with clear weather, and 0.80 ± 0.03 with different weather conditions. We therefore concluded that the variability

TABLE 2. Estimates of percent annual change in midwinter Bald Eagle counts by ecoregion, 1986-2000 (n = 563). Asterisks indicate trends significantly different from zero.

Ecoregion	% Annual Change	95% C.I.
East Coast[a]	+3.6%	1.3 - 5.9*
Eastern Woodland[b]	+2.5%	0.6 - 4.3*
Great Basin[c]	+1.3%	-0.4 - 3.0
Great Lakes[d]	+7.0%	3.5 - 10.6*
Gulf[e]	+1.4%	-0.8 - 3.6
Pacific Coast[f]	+1.6%	-0.4 - 3.5
Prairie[g]	+3.2%	1.5 - 4.8*
Rockies[h]	-0.3%	-1.8 - 1.3
Southwest Desert[i]	-1.2%	-3.9 - 1.5

[a] Southeastern Coastal Plan (27) and New England/Mid-Atlantic Coast (30)
[b] Atlantic Northern Forest (14), Central Hardwoods (24), Appalachian Mountains (28), and Piedmont (29)
[c] Great Basin (9) and Sierra Nevada (15)
[d] Boreal Hardwood Transition (12), Lower Great Lakes (13), and Prairie Hardwood Transition (23)
[e] Oaks and Prairies (21), West Gulf Coastal Plain (25), Mississippi Alluvial Valley (26), and Gulf Coastal Prairie (37)
[f] Northern Pacific Rainforest (5) and Coastal California (32)
[g] Prairie Potholes (11), Badlands and Prairie (17), Shortgrass Prairie (18)
[h] Northern Rockies (10) and Southern Rockies (16)
[i] Sonora and Mohave Deserts (33), Sierra Madre Occidental (34), and Chihuahua Desert (35)

introduced by fog/precipitation was not a systematic or important component of the variability already inherent in the eagle counts and that it was not necessary to exclude surveys conducted during fog/precipitation.

TREND ESTIMATION

Our final model retained all fixed effects and several interactions (Table 3). As expected, numbers of eagles seen increased with route length and were higher in concentration areas. However, these fixed effects did not interact with year, so we concluded that trends were similar across route lengths and concentration areas.

Counts of Bald Eagles increased 1.9% yr^{-1} across all regions from 1986 to 2000 (95% CI = 0.9-3.0%; $P < 0.001$; Table 4). Estimated counts were 33% higher in 2000 than in 1986. Of the 563 routes, 366 (65%) exhibited positive trends, and 197 (35%) exhibited negative trends.

Trends varied by region (Table 4). Model-based estimates of total counts in the Northeast increased 6.1% yr^{-1} (95% CI = 3.4 –8.8%, $P < 0.001$), whereas those in the Northwest, Southwest, and Southeast showed no change (Table 4). Increasing trends were statistically significant in the northern and eastern portion of the country, but not in the West and South. Counts in the Northeast — almost 2.5 times higher in 2000 than in 1986 — indicated much steeper trends than in other regions. Trends were positive on 90% of routes in the Northeast. The proportions of routes with increasing trends in the Northwest and the Southeast were lower than in the Northeast but higher than in the Southwest. The proportion of routes with increasing trends was much higher north of 40° N compared to the south ($G_1 = 13.91$, $P < 0.001$), and much higher east of 100° W compared to the west ($G_1 = 32.54$, $P < 0.001$; Table 4).

Trends for ecoregions also showed a general Northeast-Southwest gradient, with significant ($P < 0.05$) increases for the East Coast, Eastern Woodlands, Great Lakes, and Prairie regions. The Great Lakes region showed the greatest estimated annual increase (7%); counts in the Rockies and Southwest Desert showed non-significant decreases (Table 2).

Trends were positive in 32 states and negative in 10 states. None of the decreases was significant, but 11 of the increases were significantly different from zero (Table 1). Most of the

TABLE 3. Significance of covariates and random effects in the hierarchical mixed model used to estimate trends in midwinter counts of Bald Eagles, 1986-2000.[a]

Fixed Effects	Numerator DF	Denominator DF	F[b]	$P > F$
Year	1	547	13.23	0.0003
Route size category	3	4054	24.05	<0.0001
Route size by year	3	4054	0.80	0.4913
Region	3	4054	3.88	0.0087
Region by year	3	4054	5.14	0.0015
Region by route size	9	4054	0.71	0.6989
Region by route size by year	9	4054	0.62	0.7779
Concentration area	1	4054	364.98	<0.0001
Random Effects	**Estimate**	**Standard Error**	**Z**[c]	**$P > Z$**
Slope increments	0.996	0.096	10.66	<0.0001
Intercept increments	0.005	0.001	7.65	<0.0001
Covariance	-0.044	0.007	-6.26	<0.0001
Model residual	0.545	0.012	45.53	<0.0001

[a] Based on 563 routes and 5,180 surveys.

[b] Model estimated by restricted maximum likelihood estimation; the defining contrast for the effect is tested with an approximate *F*-test (Littell et al. 1996, McCulloch and Searle 2001).

[c] Random effects have expected value of 0; this section shows variance estimate for these effects, using maximum likelihood theory and assumption of asymptotic normality. Tests whether the variance of these random effects is 0.

TABLE 4. Estimates of trends in the midwinter Bald Eagle count and proportion of survey routes with increasing trends by region, 1986-2000.

Region[a]	No. Routes	Trend estimate[b]	Standard error[b]	P-value	Change per year[c]	Routes with increasing counts
Overall	563	0.0192	0.005	0.000	1.9%	65%
North	267	0.0348	0.008	<0.001	3.5%	73%
South	296	0.0037	0.007	0.619	0.4%	58%
East	253	0.0367	0.008	<0.001	3.7%	78%
West	310	0.0017	0.007	0.808	0.2%	55%
Northeast	98	0.0590	0.013	<0.001	6.1%	90%
Southeast	155	0.0145	0.009	0.104	1.5%	70%
Northwest	169	0.0106	0.008	0.183	1.1%	63%
Southwest	141	-0.0072	0.012	0.540	-0.7%	45%

[a] Regions defined in relation to 40° N and 100° W.
[b] Calculated from logged counts.
[c] Estimated from actual counts (back-transformed).

significant increases were in northeastern or midwestern states; the highest significant increases occurred in Michigan (9.0% yr^{-1}) and New York (8.3% yr^{-1}).

Among eagles observed and aged, 67% were adults. The mean proportion of immatures varied from 29% in the Northwest, 34% in the Southwest, 33% in the Northeast, to 37% in the Southeast. The number of immature Bald Eagles increased approximately 1.5% yr^{-1} in all regions over the 15-yr period; counts of adults increased 2.7% yr^{-1} over the same period. Increases in counts of immatures were significant in the Northeast ($P < 0.001$), but not in the other regions (P's > 0.30). Counts of immatures in the Northwest showed a declining although nonsignificant trend ($P = 0.35$). In all regions, counts of adults increased at a higher rate than immatures. The increase in numbers of adults was significant ($P < 0.04$) in all regions except the Southwest ($P = 0.81$; Fig. 2).

DISCUSSION

SURVEY LIMITATIONS

As a large-scale volunteer effort that developed over several years, the Midwinter Bald Eagle survey has a number of problems that a well-designed monitoring effort would not have. Many reports could not be used because of incomplete documentation or inconsistent survey methods. Because survey routes were not randomly selected, we do not know if the standard routes used in this analysis are representative of the contiguous 48 states. Our findings are likely biased towards states and portions of states where agencies and individuals were committed to long-term, consistent data collection. Within those areas, sampling has emphasized river stretches and water bodies where Bald Eagles are known to occur. The survey, therefore, represents a type of "convenience sampling" and is subject to the inferential

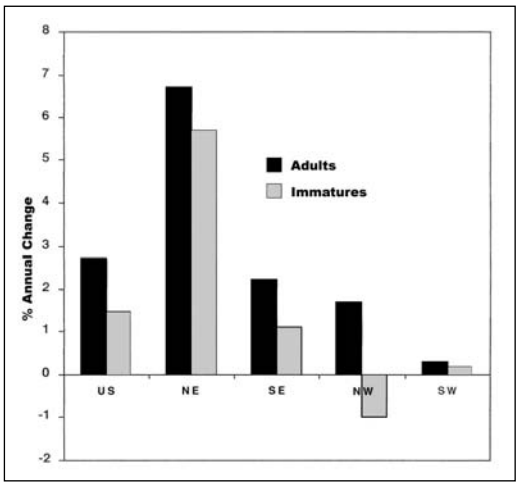

FIGURE 2. Estimated percent annual change in midwinter Bald Eagle counts by age class and region, 1986-2000. Regions are defined in relation to 40° N and 100° W.

constraints outlined by Anderson (2001). The midwinter counts cannot be used to estimate actual population size, and inferences about trends must be gauged carefully and restricted to the areas sampled by survey routes.

We have assumed that winter counts are a reasonable index to eagle abundance in the areas surveyed during the January sampling period. Trend analyses based on counts as indexes are valid only if the proportion of the population sampled is constant from year to year (Lancia et al. 1996). The ability to detect eagles may vary with many factors, including weather, topography, and vegetation. Because we treat each survey route equally and independently, our trend analysis only assumes that errors in detectability are consistent from year to year on a given survey route. Our analyses indicated that fog and precipitation did not influence counts significantly. We have controlled for variation in detectability by including only those surveys that covered the same area, using the same transportation method each year. Observer bias is likely not as much of a problem in our surveys compared to Breeding Bird Surveys (Sauer et al. 1994) and other singing-bird surveys (Bart and Schoultz 1984) because eagles are large, conspicuous, and relatively easy to identify by species and age class.

COUNT IMPLICATIONS

Our analysis confirms other findings that Bald Eagle populations in the U.S. are increasing. However, the magnitude of increase in our winter counts is not as dramatic as what has been observed for U.S. nesting populations. The number of nesting pairs reported by the Fish and Wildlife Service in the lower 48 states increased an average of 8% yr^{-1} from 1986 to 2000 (U.S. Fish and Wildlife Service unpubl. data); Breeding Bird Surveys showed Bald Eagle populations to be increasing 8% yr^{-1} from 1966 to 2000 (Sauer et al. 2001). The difference may be due to the fact that winter counts likely include individuals that nest in Canada and Alaska, where populations may not be increasing at the same rates as populations in the conterminous U.S. Spring counts of adult Bald Eagles in southeast Alaska increased from 1987 to 1992 but decreased from 1992 to 1997, suggesting that the population had stabilized (Jacobson and Hodges 1999). Our estimated trends are more similar to Christmas Bird Counts (CBC), which showed a 4.25% annual increase from 1955 to 1999 throughout North America (Sauer and Link 2000). The CBC trend may be slightly higher than our overall estimate because of the higher proportion of CBC routes in the northeastern U.S., where eagle counts appear to be increasing at a higher rate than elsewhere.

Increases in winter counts were higher in the northern and eastern part of the U.S. than in the West and South. This geographic variation could be due several factors. First, increasingly warmer winters during the sampling period (National Oceanic and Atmospheric Administration, unpubl. data) may have resulted in more eagles spending the winter farther north and fewer migrating south. New dams, spillways, and wastewater facilities that keep water from freezing in northern regions also may be enticing an increasing number of eagles to winter farther north and in greater densities at higher latitudes than in the past (Kerlinger 1989). Second, increases in winter counts may be inversely proportional to the declines suffered in the DDT-era. Population declines were most serious in the Great Lakes, Mississippi Valley, and East Coast, where both DDT and dieldrin were used heavily during the 1950s (Nisbet 1989). Just before surveys began (1980-84), residues of DDE were much higher in Bald Eagle eggs from Maine than in those from Arizona (Wiemeyer et al. 1993). Third, regional trends in Bald Eagle counts are inversely related to regional trends in human population growth. More rapid rates of human population expansion in the West and South (U.S. Census Bureau 2001) could be preventing eagles from colonizing previously suitable habitat. Bald eagle counts did not increase in the southwestern U.S during the sampling period.

Finally, the fact that counts of adults increased at almost twice the rate as counts of immatures suggests that the overall trend may reflect past increases in recruitment. In fact, the most substantial population recovery may have occurred before and at the beginning of the 15-yr sampling period. Thus, population recruitment may already be stabilizing.

RECOMMENDATIONS FOR FUTURE MONITORING

Despite its shortcomings, the Midwinter Bald

Eagle Survey represents a unique source of long-term data. Unlike nesting surveys, it provides information on both breeding and nonbreeding segments of the population at a potentially limiting time of year. It also provides an opportunity to monitor modifications or threats to habitat at important wintering areas.

Meaningful data on the population status of a mobile species like the Bald Eagle must be gathered over many years and on a large geographic scale. Previous studies have shown that when data variability is high, adding years to the survey effort will increase the power to detect population changes (Lewis and Gould 2000). Most midwinter survey routes showed a high degree of inter-year variability. The number of Bald Eagles and the timing of peak aggregations at particular wintering areas may change from year to year depending on food availability (Stalmaster 1987). Weather conditions influence the distribution of wintering Bald Eagles, with individuals moving farther south to find food in colder winters (Steenhof 1978). Eagles that usually occur on one survey route in a cold winter may be on another survey route several kilometers away in a warmer winter. Short-term counts at a limited number of survey sites can yield misleading information about population trends, when viewed alone. Long-term monitoring at sites throughout the continent provides more reliable data. The Midwinter Bald Eagle Survey provides a framework for such an effort.

The Midwinter Eagle Survey has become a national institution (Stalmaster 1987) and a tradition that will likely continue in many states. In addition to providing information on the trends, distribution, and habitat use of eagle populations, the count has helped to create public interest in Bald Eagles and their conservation. The survey is relatively economical, as the count infrastructure is in place and the analysis is relatively inexpensive. Future counts could help track how eagle populations respond to delisting and are no longer protected by the Endangered Species Act.

ACKNOWLEDGMENTS

This paper is a contribution from the USGS Forest and Rangeland Ecosystem Science Center, Snake River Field Station. Analyses would not have been possible without the cooperation of agencies and individuals in the 42 states that participated in the annual survey. We are indebted to the National Wildlife Federation for initiating the count and for providing 1986-1991 data. The Bureau of Land Management's Raptor Research and Technical Assistance Center (RRTAC) assumed responsibility for overseeing the count in 1992. Coordination and analysis continued when RRTAC staff became a part of the National Biological Survey and later the U.S. Geological Survey. The University of Minnesota's Raptor Center assisted with automating records from 1992 through 1994. We thank our many office assistants for entering and proofing data in all other years. Our paper was improved by the critical comments of D. Plumpton.

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BIRD POPULATIONS

A journal of global avian demography and biogeography

Volume 6 2001-2002

ANNUAL REPORTS OF MAJOR AVIAN MONITORING PROGRAMS

INTRODUCTION TO THE 1999 AND 2000 ANNUAL REPORTS

Birdlife International has recently used the Red List classification scheme developed by the World Conservation Union to determine that about 12% (1,186/9,797) of the Earth's remaining bird species are vulnerable to extinction within this century (Stattersfield, A.J., and D.R. Capper, eds. 2000. *Threatened Birds of the World.* Lynx Edicions, Barcelona). Fully 185 of these species are critically endangered and face an extremely high risk of extinction in the immediate future. The vast majority of all these species have very small, often fragmented ranges, and small and often declining populations. Most inhabit tropical areas or oceanic islands and fully 99% of them are at risk because of human activities. Foremost among these activities are unsustainable agricultural and timber extraction practices that cause habitat loss and degradation, followed by the introduction of invasive species, including invasive predators and competitors and even invasive plant species, and by direct exploitation of their populations by hunting and trapping, including unsustainable fishing practices. The rate of bird extinctions already far exceeds the natural rate of loss and appears to be increasing. At least 128 species have vanished over the last 500 years; 103 of these have become extinct since 1800.

While we hope that all of these nearly 1200 species will be saved from extinction, we know that some won't. As a species' population becomes smaller and it gets closer to extinction, the probability of saving it over the long-term likely decreases dramatically. Extinction of a species is, of course, the last step in a series of events that decreased its population size and decreased and fragmented its range. These decreases were in turn caused by decreases in the species' vital rates, that is, its rates of recruitment and survival. This implies that effective avian conservation must begin by attempting to maintain the population sizes and ranges of all species. This principle, in fact, has been embraced by major avian conservation efforts around the world. An oft-stated goal, for example, of the Neotropical Migratory Bird Conservation Initiative, "Partners in Flight," is "Keeping common birds common."

The first step toward accomplishing this goal is monitoring the population trends and vital rates of bird species in the area of concern. Because of the global nature of the factors that influence bird populations, including both natural and human-caused factors, the area of concern must really be the entire range of each species, even though these ranges may cross many national borders and span entire continents. The fates of long-distance migrant species, including Nearctic species that migrate to Central and South America, Palearctic species that migrate to Africa, and Palearctic species that migrate to southeast Asia and Australia, clearly lie in the hands of the people of many nations. Let us hope that the concept of "birds without borders" can inspire real cooperation among nations regarding conservation of shared avian species, especially between the more

developed nations in the north and the developing nations in the tropics, and can serve as a model for cooperation in other critical environmental efforts.

The reports that follow highlight efforts to monitor both population trends and trends in vital rates, and are filled with examples where information on vital rates is used to increase understanding of the observed population trends. The intensity of the coverage within the areas included in these reports is remarkably high. In the case of the United Kingdom, coverage includes the entire nation. Still, the total areas covered by these monitoring programs are, for the most part, but small portions of the ranges of the species involved. Nevertheless, more than 50% of the species monitored by the constant- effort sites programs in the U.K. and Spain were monitored by both programs. This suggests that a Europe-wide network of constant-effort sites will be able to provide widespread data on a substantial number of species.

These are the kinds of data that will be needed if we are to determine how the current and impending changes in global climate will affect bird populations. Because climate change involves changes in the frequency and amplitude of the major global climate cycles -- the cycles that drive annual changes in local weather all over the Earth -- understanding how these cycles affect the vital rates of birds seems key to understanding how climate change will affect bird populations. This will entail long-term, large-scale monitoring data on the vital rates of many species; data that can only come from expansions to programs like those whose annual reports are printed (or reprinted) here. Recent work using ten years of data on reproductive indices (young per adult) from MAPS (Monitoring Avian Productivity and Survivorship) stations in the Pacific Northwest of North America, for example, showed that productivity of temperate-wintering species was correlated with the March-May North Atlantic Oscillation Index (NAOI), while productivity of Neotropical-wintering species was correlated with the March-May El Niño/Southern Oscillation Precipitation Index (ESPI), and suggested that annual variation in productivity of Neotropical migrants was driven more by weather conditions on their tropical winter ranges than by weather conditions on their temperate breeding ranges (Nott et al., 2002, *Global Ecology & Biogeography* 11:333-342). These results underscore the important effect that the winter ecology of migratory species can have on their population trends, even on their productivity, and the critical importance of large-scale, long-term monitoring of avian vital rates in helping to understand these processes.

Those who have built local or national programs aimed at monitoring population trends and vital rates know the amount of effort involved in creating and, especially, in maintaining these programs over the long term. The effort that will be required to expand these programs, even with less intense coverage, and to coordinate them across many countries is truly daunting. Nevertheless, this is what is needed to build a truly global model of avian conservation. May the remarkable success achieved by the programs whose annual reports are printed in the following pages serve to inspire the efforts needed to build such a global model of avian conservation. — David F. DeSante

Bird Populations 6:35-50

THE SYLVIA PROGRAM: FIRST ANNUAL REPORT OF THE CATALAN CONSTANT EFFORT SITE SCHEME (2000-01)[1]

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Abstract. Presented here is the first annual report of the SYLVIA program, summarizing results from the 2000 breeding season and 2000-01 winter season. Also presented is a general overview of SYLVIA's main objectives, with special attention given to design and methods. Using a network of constant effort mist-net ringing stations, SYLVIA provides long-term information on landbird populations in Catalonia, including 1) major demographic parameters, 2) population trends, 3) post-breeding and pre-migratory movements, and 4) general reproductive and wintering biology. The data obtained identify 1) species' trends, 2) life-history stages involved, and 3) major causes of the change.

Unlike other similar projects (CES and MAPS), SYLVIA is concerned both with the breeding and wintering seasons. The breeding season ranges 1 May to 8 August and is divided into ten 10-d periods; the wintering season ranges 16 December to 27 February and is divided into five 15-d periods. Each station operates one morning in each of these 15 trapping periods. The first pilot station was established in 1991. In 1998, with 5 sites in operation, the program was fully evaluated and the current methodological protocols fixed.

In 2000, a total of 27 ringing stations formed the network of constant effort mist-netting sites. Of the 27 sites, 15 were new. The total birds trapped numbered 7,413 among 98 species. In general, numbers of adults decreased between 1999 and 2000, but productivity increased nearly 30%. Considering all species pooled the proportion of 2nd-year birds increased about 13%. During winter 2000-01, 22 stations operated (8 active previously). Total number of birds captured was 2,488 among 47 species. Most species exhibited decreased numbers, although over all species the trend was not significant.

Keywords: constant-effort, mist-nets, population assessment, landbird trends, Catalonia.

EL PROGRAMA SYLVIA: PRIMER INFORME ANUAL DEL PROGRAMA DE SITIOS DE ESFUERZO CONSTANTE (2000-01) EN CATALUÑA

Resumen. Presentamos el primer informe anual del programa SYLVIA, resumiendo los resultados de la temporada reproductiva de 2000 y la temporada invernal de 2000-01. También presentamos un repaso general de los objetivos principales de SYLVIA, con especial atención al diseño y los métodos. Utilizando una red de estaciones de anillamiento de esfuerzo constante, SYLVIA genera información de largo plazo sobre las poblaciones de aves terrestres en Cataluña, incluyendo (1) parámetros demográficos principales, (2) tendencias poblacionales, (3) movimientos post-natales y pre-migratorios, e (4) información general sobre biología reproductiva e invernal. Los datos obtenidos identifican (1) tendencias de especies, (2) las etapas de la historia de vida involucradas, y (3) las principales causas de los cambios.

En contraste con otros programas similares (CES y MAPS), SYLVIA opera tanto en la época reproductiva como en la invernal. La temporada de cría tiene lugar entre el 1 de mayo y el 8 de agosto y está dividida en diez periodos de diez días; la temporada de invierno comprende del 16 de diciembre al 27 de febrero y está dividida en cinco periodos de 15 días. Cada estación es operada durante una mañana en cada uno de los quince periodos de muestreo. La primera

[1]Received: 12 March 2002. Accepted: 20 October 2002

estación piloto fue establecida en 1991. En 1998, con cinco sitios activos, el programa fue evaluado y se fijaron los protocolos metodológicos actuales.

En 2000, un total de 27 estaciones de anillamiento constituyeron la red de sitios de esfuerzo constante. De los 27 sitios, 15 fueron nuevos. El total de aves capturadas fue de 7413 entre 98 especies. En general, el número de adultos disminuyó entre 1999 y 2000, pero la productividad aumentó en casi un 30%. Teniendo en cuenta todas las especies juntas, la proporción de aves de segundo año aumentó en un 13%. Durante el invierno de 2000-01, se operaron 22 estaciones (8 previamente activas). El número total de aves capturadas fue de 2488 entre 47 especies. La mayoría de las especies mostró declives, aunque para todas las especies juntas la tendencia no fue significativa.

Palabras clave: esfuerzo constante, redes de niebla, monitoreo de poblaciones, tendencias de aves terrestres, Cataluña.

LE PROGRAMME SYLVIA: PREMIER RAPPORT DU "CONSTANT EFFORT SITE SCHEME" CATALAN (2000-01)

Résumé. Le premier rapport annuel du programme SYLVIA, résumant les résultats de la saison de reproduction 2000 et de la saison hivernale 2000-01, est présenté ici. Une revue générale des objectifs principaux de SYLVIA est aussi présentée, avec une attention particulière portée au design et aux méthodes. En utilisant un réseau de stations de baguage à effort constant par filets, SYLVIA fournit une information à long terme sur les populations d'oiseaux terrestres de Catalogne, qui inclut 1) les principaux paramètres démographiques, 2) les tendances des populations, 3) les mouvements post-reproduction et pré-migration, et 4) des informations générales sur la biologie de la reproduction et de l'hivernage. Les données obtenues identifient 1) les tendances des espèces, 2) les stades d'histoire de vie impliqués, et 3) les principales causes du changement.

A la différence des autres projets similaires (CES et MAPS), SYLVIA s'intéresse à la fois à la saison de reproduction et à la saison d'hivernage. La saison de reproduction s'étend du 1er Mai au 8 Août et est divisée en dix période de 10 jours ; la saison d'hivernage s'étend du 16 Décembre au 27 Février et est divisée en cinq périodes de 15 jours. Chaque station est opérationnelle une matinée durant chacune de ces quinze périodes de capture. La première station pilote a été établie en 1991. En 1998, avec cinq sites opérationnels, le programme a été complètement évalué et le protocole méthodologique actuel a été fixé.

En 2000, un total de 27 stations de baguage formaient le réseau des sites de capture à effort constant. Sur ces 27 sites, 15 étaient nouveaux. Au total 7,413 oiseaux, appartenant à 98 espèces, ont été capturés. Une diminution générale du nombre d'adultes a eu lieu entre 1999 et 2000, mais la productivité a augmenté de près de 30%. Toutes espèces confondues, la proportion d'oiseaux dans leur 2nde année a augmenté d'environ 13%. Durant l'hiver 2000-01, 22 stations ont été opérationnelles (dont 8 précédemment actives). Au total 2,488 oiseaux appartenant à 47 espèces ont été capturés. Le nombre d'individus était en diminution pour la plupart des espèces, mais toutes espèces confondues cette tendance n'était pas significative.

Mots-clés: effort constant, filets, évaluation des populations, tendances des populations d'oiseaux terrestres, Catalogne.

DAS SYLVIA-PROGRAMM: ERSTER JAHRESBERICHT DES KATALONISCHEN DAUER-FANGPROGRAMMS (2000-01)

Zusammenfassung. Der Jahresbericht fasst die Ergebnisse des SYLVIA-Programms für die Brutsaison 2000 und den Winter 2000/01 zusammen. Zudem werden die wichtigsten Ziele des Programms erläutert, mit besonderem Augenmerk auf Versuchsdesign und auf verwendete Methoden. Mit Hilfe eines Netzwerkes von Dauer-Fanganlagen soll SYLVIA Langzeitdaten über Bestände von Landvogelarten in Katalonien liefern, insbesondere über 1) die wichtigen demographischen Parameter, 2) Bestandsveränderungen, 3) nach- und vorbrutzeitliche Wanderungen und 4) Daten zur allgemeinen Fortpflanzungs- und Überwinterungsbiologie. Diese Ergebnisse geben Auskunft über 1) Bestandstrends, 2) beteiligte Altersgruppen und 3) Hauptursachen für die beobachteten Veränderungen. Anders als bei anderen Monitoringprogrammen (CES oder MAPS) werden im SYLVIA-Programm sowohl die Brut- als auch die Wintersaison untersucht. Dabei umfasst die Brutsaison 10 Dekaden und reicht vom 1.5. bis 8.8., und die Wintersaison fünf 15-Tages-Zeiträume vom 16.12. bis 27.2. Jede Fangstation ist an einem Vormittag während jeder der insgesamt 15 Fangperioden geöffnet. Die erste Test-

Fangstation wurde 1991 eingerichtet. Mit den Ergebnissen aus 5 Fangstationen wurde das Programm beurteilt und die methodische Vorgehensweise festgelegt.

Im Jahr 2000 setzte sich das Programm aus 27 Dauerfangstationen zusammen, davon 15 neu errichtete. Insgesamt wurden in diesem Jahr 7.413 Vögel aus 98 Arten gefangen und beringt; dabei nahm die Zahl der Altvögel von 1999 auf 2000 ab, während die Produktivität um 30% anwuchs. Über alle Arten betrachtet nahm die Zahl der zweijährigen Vögel um etwa 13% zu. Im Winter 2000/01 waren 22 Fangstationen geöffnet (im Vorjahr nur 8). Die Gesamtzahl gefangener Vögel betrug 2.488 aus 47 Arten. Die meisten Arten zeigten rückläufige Zahlen, allerdings ergab sich insgesamt kein gesicherter Abnahmetrend.

Schlüsselworte: Dauerfanganlage, Japannetze, Bestandsermittlung, Landvogel-Erfassung, Katalonien.

INTRODUCTION

The number of programs monitoring avian population dynamics has increased recently in response to negative trends detected for many landbird species (e.g., Peach et al. 1991, Tucker and Heath 1994, Peach et al. 1995, DeSante and Rosenberg 1998). Most of these studies have effectively identified species exhibiting severe population declines, but little is known about the factors causing the patterns. It is of prime concern, therefore, to obtain data on the primary demographic parameters of the species monitored, as well as to identify the stages of their life cycles involved in the population changes. In fact, sound conservation-oriented research requires data on movements, survival, and other aspects of a species' biology, and only the study of marked individuals can provide such information (Baillie 1995). Given the well-known value of birds as bio-indicators, an integrated avian monitoring program can also provide information on the health of the ecosystem as whole.

SYLVIA is a program of the Catalan Ringing Scheme and aims to establish a network of constant-effort mist-net stations, thereby, to provide long-term information on the demographic parameters and population trends of Catalan landbird populations. The utility of constant-effort mist-netting has been under written by results obtained since the early 1980s in Great Britain, Ireland and, subsequently, North America. The European Union of Bird Ringing (EURING) considers the implementation of this type of study a priority.

The methodological approach of SYLVIA has been based largely on the protocols developed by the British Trust for Ornithology (CES program; Baillie et al. 1986) and the Institute for Bird Populations (MAPS program; DeSante and Burton 1997). The main feature of this approach is standardisation. Constant-effort mist-netting, as its name indicates, implies the regular operation of a study site where birds are ringed following a constant pre-established protocol and effort. Thus, the number, type and placement of the mist-nets is the same through the years. The annual number of juveniles ringed is used as an indicator of productivity, while the proportion of juveniles in the total catch is used as a relative measure of breeding success. Given that adult birds, including both migratory and sedentary species, show a marked fidelity to their breeding grounds, the proportion of adults retrapped is used to estimate survival rate.

Since 1991, when the first pilot SYLVIA station was established, the program grew slowly to reach five sites in 1998. The program was then fully evaluated. With 35 sites operated in 2001, SYLVIA has attained the level of coverage and involvement necessary to achieve its main goals. This has been possible by means of the invaluable support and partnership given by many Catalan governmental and non-governmental agencies, as well as individual ringers.

In this report we present the main characteristics of SYLVIA, its scope and a summary of results from the 1999-00 and 2000-01 efforts.

METHODS

OBJECTIVES AND GOALS

The aim of SYLVIA is to obtain long-term data for a number of target species including: 1) major demographic parameters with emphasis

on survival and productivity, breeding performance and recruitment; 2) population trends; 3) post-breeding and pre-migratory movements and dispersal of young birds; and 4) general reproductive and wintering biology of target species. Ideally, these data will be used to identify: 1) species showing declining trends, 2) the main stages of the life cycle responsible for these negative trends, and 3) the major causes of decline. As a side-effect, the program also aims to encourage ringers to take advantage of the benefits of working in a standardised manner and of computerising their own ringing data.

An important assumption of constant-effort mist-netting is that changes over time in population and demographic parameters tend to be similar for a given species within a region (DeSante et al. 1993). The biogeographical characteristics of Catalonia suggest that SYLVIA will function largely as one main regional unit. Therefore, the current main goal is to obtain population and demographic indices for the whole study area and to use them as an indicator of the health of Catalan landbird populations.

PROJECT DESIGN

The methodology used by SYLVIA is fully detailed in an unpublished document that can be obtained from the Catalan Ringing Scheme. Here we present a summary of its principal characteristics.

One of the main differences of SYLVIA with respect to similar projects elsewhere is its attention, not only to the breeding period, but also to the wintering season. The decision to extend the program to the winter is based on the fact that between-year estimates of survival rates include sources of mortality incurred throughout the entire year (DeSante 1995). Separating the seasonal components of survival, therefore, is a crucial point in identifying causes for population declines (e.g., Peach et al. 1991). The collection of winter data is also useful in understanding the movements of different species, their wintering locations and habitat use (Evans et al. 1999), both for local sedentary and wintering populations. In this respect, it should be borne in mind that the Mediterranean region is a favored wintering ground for many north and central European migratory species. The conservation value of data for such species is considerable given the lack of alternative information from African wintering grounds. Finally, volunteers are more available outside the breeding season, when the involvement of ringers tends to be greater and the processing of birds not in breeding condition is less problematic.

NUMBER, LOCATION AND TYPE OF MIST-NETS

Ringing sites are located in areas expected to remain accessible and unchanged for at least five consecutive years. The number, exact location and type of mist-net are kept constant during all ringing sessions as well as during all years of operation. The number of nets operated is the maximum number that can be operated satisfactorily and consistently. Ten 12-m mist-nets is considered to be the optimal number that one or two ringers can operate. To obtain a good balance between recapture probability and size of the population sampled, we place 1-2 nets ha^{-1} through the study area. The attraction of birds to the nets using tapes, food, water or any other system is not allowed.

PROTOCOL OF OPERATION

The program is subdivided into two main seasons: summer or breeding season and the wintering season. The breeding season ranges from 1 May to 8 August and is divided into ten 10-d periods. Each station operates once in each ten-day period beginning when migrant individuals of the target species are no longer passing through the area in significant numbers. For most of Catalonia, period 1 is the recommended starting period. Exceptions are those sites where the Reed Warbler *(Acrocephalus scirpaceus)*, a target species, is the dominant breeding species (largely reed-beds). In these sites ringing should not start until period 4 (note that the bulk of the migrating Reed Warblers pass through Catalonia during mid May). The wintering season extends from 16 December to 27 February, and is divided into five 15-d periods. Each station should be active during all periods.

Each station operates one morning during each period. Nets are opened before dawn and closed 6 hours after sunrise. A period of at least 6 days separates each visit. The ringing site is not to be active when wind speed is excessive nor when weather poses a danger for the birds.

The use of additional nets in the study area is not allowed within 500 m of any SYLVIA net. Furthermore, it is not allowed to make additional visits to the site during the month preceding the start of the summer and wintering trapping seasons.

BASIC INFORMATION AND GENERAL SITE DESCRIPTION

Since the vegetation type and structure at a given station affects population size, productivity and survivorship of birds (DeSante et al. 1993), a general description of the study area is an essential pre-requisite. For this purpose standardised basic information sheets are filled for each site, and include the percentage of the site corresponding to habitats and their subtypes as well as the three main species of tree, bush and herb present. Other information refers to the type of habitat management affecting the area (if any), the average altitude and slope. A detailed map (ca. 1:2000 scale) is prepared to delimit the main habitat types and shows the location and number of each net as well as the placement of the main geographical elements (water courses, structures, roads, trails, open water). The ringing site includes 100 m around the area containing the nets.

RECORDING MICRO-HABITAT AND RINGING-SESSION DATA

Differences in the characteristics of habitat surrounding the different mist-nets affect the spatial and temporal pattern of captures. Similarly, weather can also have a large influence on capture probability. To monitor these external variables a standardised microhabitat recording sheet is prepared on a daily basis. Data collected include basic meteorological variables and characteristics of the habitat. In this respect, microhabitat details are recorded for an area extending 20 m on each side of each net and includes data on habitat structure, presence of water and occurrence of fruits/berries. Together with weather and microhabitat details, the timing of operation of each net is recorded.

COLLECTING AND RECORDING RINGING DATA

Data required for each bird are: site name, ring number, species name, date of capture, net number, time of capture, age (EURING code) and sex, wing length (maximum chord; Svensson 1992), third primary length, weight, fat score (Kaiser 1993), muscle score (Bairlein 1995), brood patch state, molt extent and intensity, bird state when released and ringer. Except for minor exceptions, all data are recorded for all birds, whether first captures or recaptures.

Age determination is a critical component of all efforts in order to assess such parameters as survival and recruitment (DeSante 1995). Through training and experience, the number of mistakes associated with any ageing technique can be largely reduced. However, little is known about the exact degree of error associated with age determination for most of the species currently monitored. Assessment of the frequency of ageing mistakes can be used to evaluate results more realistically, and through directional training can be used to reduce them.

DETERMINATION OF BREEDING SPECIES

To avoid the inclusion of species captured outside their breeding range, a breeding status list for each station is compiled. A standard form similar to that used in breeding bird atlas projects is used. To compile the list, any point within 500 m of any net is considered as part of the ringing station.

DATA SUBMISSION AND VERIFICATION

At the end of each season, each station provides a copy of all field sheets as well as all the data computerised using NouBioPro2.00, a PC program created with Visual Basic for Applications. As soon as all data are received they are verified for code inconsistencies and typing errors using a program module associated with our central database (a modified version of NouBioPro2.00).

DATA ANALYSIS

Main analytical procedures. The methods of data analysis used here are largely based on the procedures developed by the BTO (Baillie et al. 1986). Following the current standards set by the British CES program, we calculate species-specific between-year changes in the numbers of juvenile and adult birds as well as in the proportion of juveniles in the total catch of the breeding season. Similarly, we calculate

between-year changes in the numbers of young and adult birds captured during the winter as well as those changes related to the proportion of young birds in the total catch. Considering the problem of distinguishing young from adult birds in winter (in some species impossible), for the winter season we also calculate between-year changes in the total number of captures (i.e., without separating age-classes). As a further calculation, we also estimate between-year changes in the proportion of 2nd-year birds among the total number of adult birds captured during the breeding season.

The importance of separating young birds from adults in winter as well as 2nd-year birds from older birds during the breeding season is very clear when considering age-dependent or lifetime reproductive success, as well as complex age-class survival analysis models. However, less complex parameters (e.g., the proportion of 2nd-year birds during the breeding season or young birds in winter) can also be very useful. The proportion of 2nd-year birds can help to estimate recruitment. Recruitment is a key demographic parameter, and alone can account for most of the variability in the size of the breeding population (DeSante 1995). On the other hand, information on age structure of the wintering population can provide important data on age-related differences in survival, habitat use, or movements.

All calculations undertaken for the present report were conducted according to the following protocol. The age of all individual birds was homogenised for any given year and season. For this purpose, the age class determined the first time each bird was captured during that season and year was assigned to all records of that bird in that season/year. Birds were assigned to the following age classes depending on the season and the type of analysis: juvenile vs. adult (to assess the number of birds born during the current year from older birds as well as the proportion of 1st-year birds in summer); young vs. adult (to separate the number of birds born during the previous breeding season from older birds as well as to calculate the proportion of the former in the winter season); and 2nd-year bird vs. older adults (to assess the proportion of 2nd-year birds among adult birds in summer). We did not determine the age of birds a posteriori (i.e., using capture histories), since this would produce an artificial increase of the older classes (with longer capture histories) against younger ones. After age homogenisation, only one record of each individual bird, year and season was included in the analysis.

Breeding season:

1. Data for a given species at a particular site were included in the analysis only when that site was within the breeding range of the species. For two trans-Saharan migrants with a very delayed spring migration, Reed Warbler and Melodious Warbler *(Hippolais polyglotta)*, only data from periods 4 to 9 were included. We preferred to reduce sample size but gain data quality by excluding a large proportion of migrating birds.

2. Data were included if a given site was operated during at least three of the first five 10-day periods and during at least three of the five later 10-d periods in each of the two years.

3. Sites were excluded from the adult and juvenile between-year-change analysis if the total number of adults and juveniles was zero in both years. For the proportion of juveniles, only sites where the total catch (adults + juveniles) was more than zero in both years were included. Similarly, for the proportion of 2nd-year birds, only sites where the total catch (2nd-year + older birds) was more than zero in both years were included.

4. The indices of between-year change, standard errors and 95% confidence intervals were calculated using formulae given by Peach et al. (1996). Between-year change was considered significant at $P < 0.05$, when confidence intervals did not include zero.

Winter season:

1. Data from a given site were included if the site was operated during at least three 10-day periods in each of the two years.

2. Sites were excluded from the adult and young between-year-change-analysis if the total number of adults and young was zero in both years. For the proportion of young, only sites where the total catch (adults + young) was more than zero in both years were included.

Otherwise, regardless of season, only data from periods operated in both years were included. The indices of between-year change, standard errors and 95% confidence intervals were calculated after Peach et al. (1996). A given

between-year change was considered significant at $P<0.05$ when confidence intervals did not include zero.

Since the number of SYLVIA stations have been rapidly growing, we also present here data on population size, productivity, and the proportion of 2nd-year and young birds. We used all data collected in the breeding season 2000 and the winter season 2000-01. The procedures are those described above.

Ageing reliability. To assess the reliability of the ageing decisions, we calculated the rate of ageing mistakes made for each species, sex and season (summer and winter). Ageing errors were evaluated for the following age-class determinations: 2nd-year birds vs. older adults for the breeding season, and young birds vs. adult birds for the winter season. For this purpose we used the capture histories of birds trapped in different years or seasons. Each individual bird's age-class was evaluated according to the time elapsed since the bird was first captured and/or according to the age-class it was assigned (juveniles vs. adult) during the previous breeding season (e.g., a bird classified as juvenile in summer 2000 and aged as adult –EURING code 4 in December that same year would be a mistake; one bird ringed in 1998 and aged as a 2nd-year bird in summer 2000 would also be a mistake). Only the first age determination for each individual bird, season and year cycle was considered for the analysis. The rate of ageing errors was calculated as the proportion of erroneous age-class assignments of the total number of age-class assignments evaluated (i.e., those that can be classified as correct or erroneous). In the present report, these rates are only used in analysis of population age-structure to give an overall indication of the reliability of the underlying age-class assignments.

Selection of target species. Following guidelines used by MAPS (DeSante et al. 1993), the selection of SYLVIA target species should ideally be based on the following considerations: 1) the biological interest of the species; 2) the fact that the analytical models used to infer demographic parameters are appropriate; and 3) the species are sampled in sufficient numbers and on a sufficient number of sites to allow calculation of the demographic parameters with ample precision. For instance, in order to obtain good demographic estimates derived from capture-recapture analysis for a given species, about 150 adult birds of the species should be sampled each year (Pollock et al. 1990, DeSante et al. 1993). On the other hand, to detect significant change in adult population size and productivity the species should be sampled at a minimum of 20-30 different sites (DeSante et al. 1993, Baillie et al. 1996).

The current list of targets includes 22 species for the breeding season and 14 for the winter season. However, for those analyses concerned with population age-structure (i.e., the proportion of 2nd-year birds in summer and young birds in winter), species with insufficient sample size or with an associated very high observer ageing error rate (or which can not be aged at all) have been excluded. In total, 11 species are included in the breeding season and 7 for the winter-period age-structure analysis. On the other hand, for four species showing a marked sexual difference in observer ageing error rate (Blackbird *Turdus merula*, Sardinian Warbler *Sylvia melanocephala*, Blackcap *Sylvia atricapilla* and Great Tit *Parus major*), age-structure analysis has been conducted separately for each sex.

RESULTS

SUMMER

Number and distribution of stations and overall capture rates. A total of 13 stations, including 8 new ones, operated during 1999. In 2000, the number of stations grew to 27. Of these, 15 were new (see Appendix 1, Figure 1).

The average number of periods during which stations were active was 9.04 and the average capture index was 26.16 birds per station (Table 1). The total number of birds trapped was nearly 7,500 and the total number of species almost 100.

Adult population size and productivity. In general, numbers of adult birds decreased between 1999 and 2000 (12 species showed negative and 7 positive changes). However, all changes except that for House Sparrow *(Passer domesticus)* lacked statistical significance (Table 2). In contrast, the 2000 breeding season was distinctly more productive than the previous one (Table 2). Most species (86%) showed a positive change in the number of juveniles

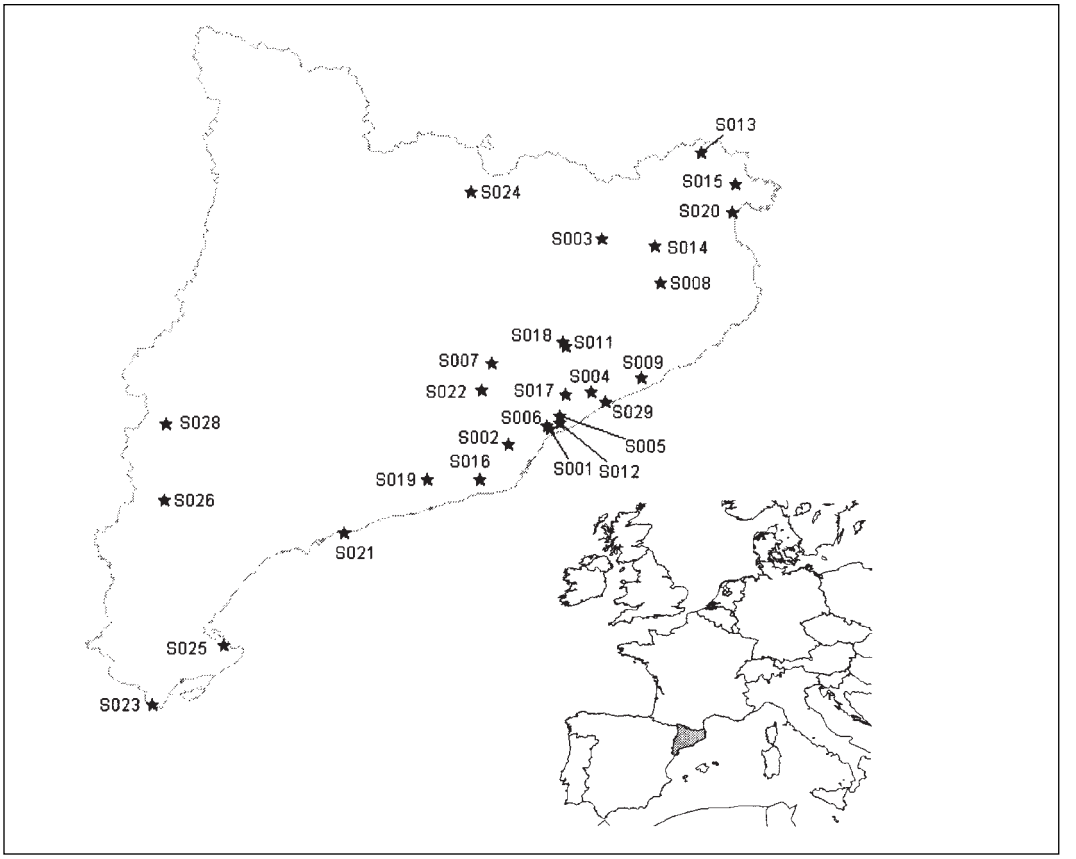

FIGURE 1. Locations of the 27 SYLVIA sites operating in 2000. See Table 1 for site codes.

captured; in three the change was significant: Subalpine Warbler *(Sylvia cantillans)*, Blackcap *(Sylvia atricapilla)* and Long-tailed Tit *(Aegithalos caudatus)*. The overall increase for all target species combined was significant and close to 30%. One of the few species showing a significant negative change in juvenile numbers, the House Sparrow was the only one that showed a significant negative trend in adult numbers. For most species, the weak negative trends in adult numbers and the marked increase in the number of juveniles is not paralleled by a significant increase in the post-fledging breeding success, as indicated by changes in the proportion of juveniles in the total catch (Table 2). However, the tendency, though slight, has been thus: 13 of 21 species showed an increase in the proportion of juveniles, with an overall increase for all target species pooled of about 7%.

Although the number of stations operating in 2000 more than doubled those of the previous analysis, the proportion of juveniles calculated for each target species (Table 3) was very similar to those shown in Table 2, and in fact, were highly correlated (Spearman Rank Correlation, $r = 0.94$, $P < 0.01$).

Adult breeding population age-structure. An increased proportion of 2nd-year birds during the 2000 breeding season was clearly evident: all except two of the 15 species/sex classes increased, though, in only one case, female Blackbird, did it attain statistical significance (Table 4). Considering all the species pooled, the increase is close to 13%, very nearly attaining significance.

Figures obtained for the proportion of 2nd-year birds among the adult breeding population

TABLE 1. Summary of results obtained from the 27 SYLVIA stations operating during the 2000 breeding season.

Site Code	Station name	Years	Periods	Capture Index[a]	Number of captures: 2000 Ringed	Number of captures: 2000 Recapture	Number of captures: All years combined Ringed	Number of captures: All years combined Recapture	Species: 2000	Species: All Years
S001	Ca l'Andreu	10	10	8.8	84	21	949	376	23	50
S002	Can Balasc	7	10	21.9	188	75	1026	507	28	39
S003	Estanys de Can Jordà	4	10	24.0	209	79	608	224	34	47
S004	Ca l'Arenes	3	10	20.4	184	61	464	190	28	41
S005	Can Ràpia	3	10	17.8	131	82	368	194	20	27
S006	La Conreria	2	10	14.7	139	37	328	87	19	35
S007	Les Refardes	2	10	9.6	80	35	174	50	21	29
S008	Salt	2	10	50.3	430	173	745	326	38	39
S009	Can Jordà	2	10	25.9	224	87	412	156	32	33
S011	Pla d'en Xixa	2	9	8.4	74	17	144	22	21	28
S012	El Garrofer	2	10	25.8	234	76	662	210	27	31
S013	Requesens	1	10	29.8	297	61	297	61	28	28
S014	La Puda	1	10	78.8	709	237	709	237	34	34
S015	Vilajuïga	1	9	37.8	310	98	489	116	23	26
S016	Castell d'Eramprunyà	1	10	18.4	177	44	177	44	19	19
S017	Bosquina riu Mogent	1	3	48.9	104	72	104	72	18	18
S018	Pla de la Calma	1	8	6.9	62	4	62	4	22	22
S019	Olèrdola	1	10	17.2	170	36	170	36	22	22
S020	Roncaires	1	6	50.6	280	84	280	84	24	24
S021	Punta de la Móra	1	10	19.8	216	21	216	21	31	31
S022	Serra Llarga	1	10	7.9	68	27	68	27	13	13
S023	Vinaròs	1	10	6.9	81	2	81	2	12	12
S024	Coll de Pal	1	10	27.8	277	57	277	57	30	30
S025	Canal Vell	1	6	17.5	102	24	102	24	9	9
S026	Sebes	2	9	60.3	509	142	1069	244	34	40
S028	Utxesa	1	7	29.5	194	54	194	54	21	21
S029	Caldetes	1	7	20.7	144	30	144	30	25	25
Mean		2.07	9.04	26.16	210.26	64.30	382.19	127.96	24.30	28.63
Totals for all stations combined					5677	1736	10319	3455	98	102

[a] Capture index calculated by dividing total number of captures by the number derived by multiplying meters of mist-nets times periods of operation; the final figure is multiplied by 100.

TABLE 2. Changes in numbers of juveniles and adults captured, and in the proportion of juveniles in the total catch for target species, between 1999 and 2000. *N* indicates number of stations; *SE* = standard error; * indicates a significant change at $P < 0.05$. See main text, under data analysis, for further details.

											Proportion of juveniles						
	Adults					Juveniles					1999			2000			
Species	n	1999	2000	Percent	SE	n	1999	2000	Percent	SE	n	Aged	Prop.	Aged	Prop.	Change	SE
Troglodytes troglodytes	8	19	24	26.3	34.7	10	18	21	16.7	32.2	9	36	0.472	45	0.467	-0.006	0.121
Erithacus rubecula	9	61	61	0.0	20.0	10	108	145	34.3	18.6	8	161	0.646	206	0.704	0.058	0.050
Luscinia megarhynchos	11	86	80	-7.0	8.6	11	38	43	13.2	32.3	11	124	0.306	122	0.352	0.046	0.060
Turdus merula	12	141	132	-6.4	8.9	12	184	222	20.7	15.3	12	325	0.566	354	0.627	0.061	0.086
Turdus philomelos	9	11	10	-9.1	29.1	8	21	18	-14.3	28.7	7	29	0.690	28	0.643	-0.047	0.160
Cettia cetti	5	24	19	-20.8	32.9	7	45	58	28.9	29.5	5	68	0.647	74	0.743	0.096	0.128
Acrocephalus scirpaceus	1	85	106	24.7		1	63	95	50.8		1	148	0.426	201	0.473	0.047	
Acrocephalus arundinaceus	1	14	22	57.1		1	6	9	50.0		1	20	0.300	31	0.290	-0.010	
Hippolais polyglotta	10	88	75	-14.8	19.7	8	22	30	36.4	48.2	9	105	0.200	105	0.286	0.086	0.065
Sylvia cantillans	5	6	18	200.0	74.5	10	21	31	47.6	25.2*	5	25	0.760	41	0.610	-0.150	0.147
Sylvia melanocephala	8	56	37	-33.9	13.0	10	126	167	32.5	24.0	9	182	0.692	203	0.818	0.125	0.038
Sylvia atricapilla	8	72	67	-6.9	19.7	12	76	148	94.7	19.0*	9	144	0.500	212	0.684	0.184	0.095
Regulus ignicapillus	7	8	8	0.0	50.5	7	9	10	11.1	65.7	6	17	0.529	16	0.563	0.033	0.196
Aegithalos caudatus	9	12	30	150.0	182.2	8	17	42	147.1	63.6*	7	25	0.680	55	0.618	-0.062	0.177
Parus caeruleus	10	32	34	6.3	23.3	8	37	42	13.5	39.5	9	68	0.544	76	0.553	0.009	0.143
Parus major	11	34	49	44.1	30.9	12	102	129	26.5	29.3	10	135	0.748	172	0.733	-0.016	0.121
Certhia brachydactyla	7	17	20	17.6	32.2	9	17	23	35.3	59.8	8	33	0.485	42	0.524	0.039	0.137
Passer domesticus	10	115	86	-25.2	9.0*	7	44	17	-61.4	14.4*	9	157	0.280	103	0.165	-0.115	0.096
Fringilla coelebs	4	7	6	-14.3	87.7	2	2	4	100.0	200.0	3	5	0.400	10	0.400	0.000	0.404
Serinus serinus	11	48	32	-33.3	26.7	5	19	23	21.1	53.8	8	61	0.311	51	0.451	0.140	0.121
Carduelis chloris	9	23	17	-26.1	28.3	6	5	5	0.0	62.0	5	27	0.185	17	0.235	0.050	0.115
Carduelis carduelis	7	25	19	-24.0	38.5	4	16	11	-31.3	39.8	4	37	0.432	29	0.379	-0.053	0.219
ALL SPECIES POOLED	12	984	952	-3.3	4.0	12	996	1293	29.8	8.4*	12	1980	0.503	2245	0.576	0.073	0.036

TABLE 3. Proportion of juveniles in the total 2000 breeding-season catch for target species. See Table 1 for explanation of terms and main text, under data analysis, for further details.

Species	n	Aged	Prop.	SE
Troglodytes troglodytes	13	84	0.536	0.102
Erithacus rubecula	16	317	0.700	0.032
Luscinia megarhynchos	24	276	0.322	0.036
Turdus merula	24	587	0.606	0.050
Turdus philomelos	10	33	0.636	0.120
Cettia cetti	12	131	0.710	0.071
Acrocephalus scirpaceus	5	506	0.435	0.051
Acrocephalus arundinaceus	4	68	0.353	0.046
Hippolais polyglotta	19	188	0.277	0.050
Sylvia cantillans	16	137	0.628	0.049
Sylvia melanocephala	20	637	0.645	0.069
Sylvia atricapilla	18	399	0.692	0.038
Regulus ignicapillus	12	32	0.531	0.102
Aegithalos caudatus	16	133	0.669	0.064
Parus caeruleus	16	133	0.549	0.072
Parus major	23	272	0.647	0.084
Certhia brachydactyla	16	83	0.494	0.068
Passer domesticus	17	272	0.213	0.078
Fringilla coelebs	7	32	0.344	0.110
Serinus serinus	20	119	0.303	0.080
Carduelis chloris	14	65	0.215	0.068
Carduelis carduelis	12	88	0.284	0.049
ALL SPECIES POOLED	26	4592	0.530	0.022

TABLE 4. Changes in the proportion of 2nd-year birds caught for target species between the 1999 and 2000 breeding seasons. Ageing reliability indicates the rate of ageing error associated with each species/sex (+ <5%; ++ 5-10%; +++ >10%; - not enough sample size to be quantified). See Table 2 for explanation of terms, and main text, under data analysis, for further details.

			1999		2000			
Species	Ageing reliability	n	Aged	Prop.	Aged	Prop.	Change	SE
Troglodytes troglodytes	++	6	15	0.667	16	0.750	0.083	0.215
Erithacus rubecula	++	8	56	0.554	59	0.610	0.057	0.128
Luscinia megarhynchos	+	10	77	0.519	76	0.566	0.046	0.084
Turdus merula (male)	++	9	72	0.292	66	0.515	0.223	0.123
Turdus merula (female)	+++	11	54	0.278	54	0.685	0.407	0.105
Sylvia melanocephala (male)	+++	5	30	0.700	12	0.583	-0.117	0.133
Sylvia melanocephala (female)	+++	6	18	0.556	16	0.750	0.194	0.205
Sylvia atricapilla (male)	+++	7	41	0.585	33	0.818	0.233	0.165
Sylvia atricapilla (female)	+++	5	15	0.667	20	0.750	0.083	0.135
Parus caeruleus	+	8	27	0.333	33	0.455	0.121	0.162
Parus major (male)	+	6	13	0.462	20	0.600	0.138	0.199
Parus major (female)	+++	7	11	0.455	17	0.765	0.310	0.210
Serinus serinus	-	7	34	0.676	23	0.652	-0.024	0.188
Carduelis chloris	-	4	16	0.500	12	0.667	0.167	0.198
Carduelis carduelis	-	3	10	0.700	15	0.800	0.100	0.135
ALL SPECIES POOLED		12	535	0.505	509	0.631	0.126	0.053

using the whole 2000 data set (Table 5) matches very well with those obtained using only the 12 sites included in the between-year analysis (Spearman Rank Correlation, $r = 0.89$, $P < 0.05$).

WINTER

Number and distribution of stations and overall capture rates. A total of 8 SYLVIA stations operated during winter 1999-00 (Table 6). All except two were new. During winter 2000-01, the number of stations grew to 22. Of these, eight were operated previously (see also Appendix 1, Figure 1). The average number of periods during which stations were active was 4.50 and the average capture index was 21.39 birds per station. The total number of birds captured was 2,488 and the total number of species 47.

Population size and age-class structure. Among species captured during both winters, most (9 against 5) showed a decrease in numbers (Table 7). All three species that are exclusively, or nearly so, captured during winter (Dunnock *Prunella modularis*, Chiffchaff *Phylloscopus collybita* and Chaffinch *Fringilla coelebs*) decreased markedly (a pooled significant decrease of -76.94%, SE=14.36, $P<0,05$). In total, the negative change was significant in Wren *(Troglodytes troglodytes)*, Dunnock and Chaffinch; only the Firecrest *(Regulus ignicapillus)* exhibited a significant increase.

Between-winter changes in numbers of young and adult birds, as well as in the proportion of young, was calculated also for a reduced number of species (and sex groups; Table 8). No clear tendency was apparent in young and adult numbers, but decreases in numbers of adult birds was found in male Blackbird and male Great Tit. In both cases the number of young birds also decreased, though not significantly. The change in the proportion of young was only significant in female Blackcap. The proportion of young was also estimated using the whole 2000-01 winter data set (Table 9). The correlation between theses figures and those obtained from the more limited constant-effort data (Table 8) was weak but significant (Spearman Rank Correlation, $r = 0.65$, $P < 0.05$).

DISCUSSION

In spite of the limited number of stations having data for between-year comparisons, results indicated significant changes for both the breeding and the winter seasons (Tables 2, 4, 7 and 8). With an expected stabilized minimum of 30 stations, the ability to make comparisons will be much greater in following years.

The fact that figures on the proportion of juveniles and 2nd-year birds captured during

TABLE 5. Proportion of 2nd-year birds in the total adult breeding season catch of 2000 for target species. See Tables 2 and 4 for explanation of terms, and main text, under data analysis, for further details.

Species	Ageing reliability	n	Aged	Prop.	SE
Troglodytes troglodytes	++	10	30	0.667	0.119
Erithacus rubecula	++	13	90	0.622	0.069
Luscinia megarhynchos	+	20	171	0.573	0.050
Turdus merula (male)	++	22	126	0.468	0.064
Turdus merula (female)	+++	20	86	0.628	0.070
Sylvia melanocephala (male)	+++	14	113	0.549	0.084
Sylvia melanocephala (female)	+++	13	98	0.643	0.089
Sylvia atricapilla (male)	+++	11	66	0.788	0.056
Sylvia atricapilla (female)	+++	9	37	0.838	0.085
Parus caeruleus	+	15	59	0.441	0.072
Parus major (male)	+	19	51	0.627	0.077
Parus major (female)	+++	16	34	0.706	0.094
Serinus serinus	-	18	73	0.575	0.078
Carduelis chloris	-	12	43	0.512	0.099
Carduelis carduelis	-	11	53	0.717	0.056
ALL SPECIES POOLED		24	1132	0.602	0.030

TABLE 6. Summary of results obtained from the 22 SYLVIA stations operating during the 2000-01 winter season. See Table 1 for calculation of capture index.

					Number of captures					
					2000-01		All years combined		Number species	
Site Code	Station name	Years	Periods	Capture index	Ringed	Recaptured	Ringed	Recaptured	2000-01	All years
S001	Ca l'Andreu	2	5	11.2	40	27	88	60	15	22
S002	Can Balasc	1	5	20.0	77	43	77	43	18	18
S003	Estanys de Can Jordà	4	5	21.2	84	43	759	175	25	39
S004	Ca l'Arenes	2	5	30.0	119	61	185	104	19	21
S005	Can Ràpia	3	5	20.0	73	47	175	143	17	24
S006	La Conreria	2	5	11.3	45	23	103	42	11	13
S007	Les Refardes	1	5	10.2	50	11	50	11	13	13
S008	Salt	2	4	28.5	92	45	193	99	18	21
S009	Can Jordà	2	5	25.5	97	56	225	152	21	26
S011	Pla d'en Xixa	1	3	3.6	13	0	13	0	6	6
S012	El Garrofer	2	5	28.7	99	73	172	120	18	20
S013	Requesens	1	4	17.5	64	20	64	20	16	16
S014	La Puda	1	5	37.3	128	96	128	96	22	22
S015	Vilajuïga	1	4	4.6	19	3	19	3	6	6
S016	Castell d'Eramprunyà	1	4	35.6	126	45	126	45	12	12
S018	Pla de la Calma	1	5	3.0	17	1	17	1	7	7
S019	Olèrdola	1	3	20.0	48	24	48	24	14	14
S020	Roncaires	1	5	32.2	138	55	138	55	18	18
S021	Punta de la Móra	1	3	63.1	206	21	206	21	18	18
S022	Serra Llarga	1	5	18.8	84	29	84	29	17	17
S023	Vinaròs	1	5	8.3	43	7	43	7	13	13
S029	Caldetes	1	4	20.0	78	18	78	18	21	21
Mean		1.50	4.50	21.39	79.09	34.00	135.95	57.64	15.68	17.59
Totals for all stations combined					1740	748	2991	1268	47	55

TABLE 7. Changes in the numbers of individual birds captured for target species between the 1999-00 and 2000-01 winter seasons. See Table 2 for explanation of terms and main text, under data analysis, for further details.

Species	n	99-00	00-01	Percent change	SE
Troglodytes troglodytes	7	16	6	-62.5	14.4*
Prunella modularis	8	35	20	-42.9	19.4*
Erithacus rubecula	8	128	152	18.8	23.6
Turdus merula	8	68	67	-1.5	16.4
Turdus philomelos	8	36	26	-27.8	21.2
Cettia cetti	5	8	12	50.0	79.1
Sylvia melanocephala	8	38	51	34.2	19.0
Sylvia atricapilla	8	125	108	-13.6	10.1
Phylloscopus collybita	8	67	50	-25.4	19.3
Regulus ignicapillus	8	32	57	78.1	26.6*
Aegithalos caudatus	8	56	65	16.1	33.0
Parus caeruleus	8	55	52	-5.5	42.0
Parus major	8	50	34	-32.0	11.7
Fringilla coelebs	7	375	40	-89.3	5.0*
ALL SPECIES POOLED	8	1089	740	-32.0	23.9

TABLE 8. Changes in the proportion of young birds in the total catch for target species between the 1999-00 and 2000-01 winter seasons. See Tables 2 and 4 for explanation of terms, and main text, under data analysis, for further details.

Species	Aging reliability	Adults					Young					Proportion young						
												99-00			00-01			
		n	99-00	00-01	Percent	SE	n	99-00	00-01	Percent	SE	n	Aged	Prop.	Aged	Prop.	Change	SE
Troglodytes troglodytes	-	6	8	3	-62.5	20.5	5	6	2	-66.7	30.4	4	10	0.500	5	0.400	-0.100	0.268
Erithacus rubecula	+	8	46	30	-34.8	21.7	8	81	120	48.1	45.0	8	127	0.638	150	0.800	0.162	0.108
Turdus merula (male)	++	8	15	20	33.3	77.1	7	14	16	14.3	31.0	7	29	0.483	31	0.484	0.001	0.222
Turdus merula (female)	+	8	14	7	-50.0	12.1*	7	24	21	-12.5	26.9	7	37	0.649	28	0.750	0.101	0.084
Sylvia melanocephala (male)	+	5	8	8	0.0	39.5	8	11	19	72.7	50.1	7	19	0.579	26	0.692	0.113	0.123
Sylvia melanocephala (female)	+++	6	4	7	75.0	119.0	8	13	16	23.1	47.9	7	17	0.765	22	0.682	-0.083	0.157
Sylvia atricapilla (male)	-	6	11	9	-18.2	34.7	8	48	39	-18.8	13.8	8	59	0.814	48	0.813	-0.001	0.095
Sylvia atricapilla (female)	-	6	2	13	550.0	509.4	8	61	43	-29.5	11.5	8	63	0.968	56	0.768	-0.200	0.057*
Parus caeruleus	++	8	19	13	-31.6	27.8	8	36	39	8.3	53.0	8	55	0.655	52	0.750	0.095	0.071
Parus major (male)	+	7	11	4	-63.6	13.9*	8	18	16	-11.1	24.9	7	27	0.630	20	0.800	0.170	0.088
Parus major (female)	++	4	5	3	-40.0	37.5	6	15	10	-33.3	30.8	5	20	0.750	12	0.750	0.000	0.149
ALL SPECIES POOLED		8	144	119	-17.4	14.6	8	328	342	4.3	18.7	8	472	0.695	461	0.742	0.047	0.049

the breeding season were highly correlated with those from the larger 2000 sample, suggests that the network of stations detects regional changes in population dynamics. Therefore, the entire network is necessary to achieve an understanding of the overall state of the Catalonian landbird populations. On the other hand, the much weaker correlation between the proportion of young calculated for the full 2000-01 winter data-set and that from the limited number of stations available for between-year analysis, suggests that this parameter is linked to within-region variability. Nevertheless, the increasing number of stations will allow, as well, much closer inspection of patterns in the near future. Among other questions, the different demographic responses of local sedentary species and those exclusively found in winter would be more effectively investigated.

ACKNOWLEDGEMENTS

SYLVIA receives the support of the Departament de Medi Ambient de la Generalitat de Catalunya and the collaboration of many persons and institutions: Ajuntament de Banyoles, Ajuntament de Terrassa, DEPANA, Departament de Medi Ambient (Parcs Naturals del Cadí-Moixerò, Delta de l'Ebre, Cap de Creus, Aiguamolls de l'Empordà and Zona Volcànica de la Garrotxa. PNIN de l'Albera), Diputació de Barcelona (Parcs Naturals del Motnseny, Montnegre-Corredor, Garraf and Sant Llorenç. Parc Comarcal d'Olèrdola), Jordi Giró, Fundació Territori i Paisatge, Parc de Collserola, Parc Serra de Marina and Parc Serralada Litoral.

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TABLE 9. Proportion of young birds in the total winter season catch of 2000 for target species. See Table 2 and 4 for explanation of terms and main text, under data analysis, for further details.

Species	Ageing reliability	n	Aged	Prop.	SE
Troglodytes troglodytes	-	10	22	0.591	0.104
Erithacus rubecula	+	20	382	0.741	0.040
Turdus merula (male)	++	22	75	0.533	0.061
Turdus merula (female)	+	19	67	0.627	0.049
Sylvia melanocephala (male)	+	19	75	0.707	0.058
Sylvia melanocephala (female)	+++	16	65	0.800	0.046
Sylvia atricapilla (male)	-	17	107	0.841	0.040
Sylvia atricapilla (female)	-	17	127	0.811	0.042
Parus caeruleus	++	16	108	0.694	0.051
Parus major (male)	+	15	38	0.737	0.069
Parus major (female)	++	12	28	0.821	0.060
ALL SPECIES POOLED		22	1100	0.731	0.024

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APPENDIX 1. Location and habitat characteristics of SYLVIA sites in 2000-01.

Town	Province	UTM 1x1	Elev. (m)	Main habitat(s)
Tiana	Barcelona	439-4593	200	Maquia
Barcelona	Barcelona	423-4587	250	Holm oak forest
Sta Pau	Girona	459-4665	540	Wet meadows/mixed forest
Dosrius	Barcelona	455-4607	480	Holm oak forest/fields
Vilassar de Dalt	Barcelona	443-4598	240	Holm oak forest
Tiana	Barcelona	438-4594	240	Maquia
Mura	Barcelona	417-4618	520	Pine forest/fields
Salt	Girona	481-4648	80	Riparian forest
Sta Susanna	Barcelona	474-4612	60	Holm oak forest/fields
El Brull	Barcelona	450-4625	740	Holm oak forest
Montseny	Barcelona	445-4624	1280	Montane scrubland
Teià	Barcelona	443-4595	180	Maquia/pine forest
La Jonquera	Girona	496-4698	280	Cork oak forest/maquia
Banyoles	Girona	479-4662	170	Riparian forest/reedbeds
Vilajuïga	Girona	509-4686	70	Cork oak forest/maquia
Gavà	Barcelona	412-4574	390	Garrigue
La Roca del Vallès	Barcelona	445-4606	130	Riparian forest
El Brull	Barcelona	444-4626	1180	Montane scrubland
Olèrdola	Barcelona	392-4574	210	Old fields/pine forest
Castelló d'Empúries	Girona	508-4675	0	Tamarix forest/reedbeds
Tarragona	Tarragona	360-4554	30	Pine forest
Terrassa	Barcelona	413-4608	600	Pine/holm oak forest
Vinaròs	Castelló	285-4490	20	Orange orchards
Guardiola de Berguedà	Barcelona	410-4683	1920	Subalpine fields/open pine forest
Deltebre	Tarragona	313-4512	0	Reedbeds
Flix	Tarragona	292-4568	40	Reedbeds
Sarroca de Lleida	Lleida	293-4597	150	Reedbeds
Arenys de Mar	Barcelona	460-4603	90	Pine forest

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CHANGES IN BREEDING BIRD POPULATIONS, 1998-99

FIONA SANDERSON, JOHN MARCHANT AND DAVID GLUE
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The 1998-99 Common Birds Census revealed significant annual increases for a number of species. *Fiona Sanderson, John Marchant* and *David Glue* report the results of the penultimate year of this long-running survey

CAMBIOS EN LAS POBLACIONES DE AVES REPRODUCTORAS, 1998-99
El Censo de Aves Comunes (Common Bird Census) de 1998-99 mostró aumentos anuales significativos en varias especies. *Fiona Anderson, John Marchant* y *David Glue* informan sobre los resultados del penúltimo año de este longevo muestreo.

EVOLUTION DES POPULATIONS D'OISEAU NICHEURS, 1998-99
Le Common Bird Census de 1998-99 a révélé un accroissement annuel significatif des populations de plusieurs espèces. *Fiona Sanderson, John Marchant* et *David Glue* exposent les derniers résultats de cette étude à long terme.

VERÄNDERUNGEN DER BRUTBESTÄNDE VON 1998-99.
Das Monitoring häufiger Brutvogelarten CBC ergab von 1998-99 signifikante Bestandszunahmen bei einer Reihe von Arten. *Fiona Sanderson, John Marchant* und *David Glue* berichten über die Ergebnisse des vorletzten Jahres dieses Langzeit-Monitoring programms.

The Common Birds Census (CBC) has been monitoring common and widespread breeding birds in the UK since 1962. Its main focus is on farmland and woodland habitats. The data generated by the CBC are used for a wide variety of applications, from alerting the government to significant changes in bird populations to research on the details of bird-habitat interactions. One of the most recent uses of CBC data was a report published jointly by the RSPB and BTO, *The State of the UK's Birds 1999.* This used information from the CBC and other surveys to show population trends amongst UK birds and to highlight species most in need of conservation action due to declines in numbers or very small populations. A number of species monitored by the CBC are UK Biodiversity Action Plan priority species — particularly farmland species such as Grey Partridge, Tree Sparrow, Reed Bunting and Corn Bunting.

CHANGES FOR THE CBC

In 1994, the BTO/JNCC/RSPB Breeding Bird Survey (BBS) was introduced. This survey also monitors common and widespread breeding

birds. It does so in a different way to the CBC, and is more appropriate for the role of a national bird monitoring scheme for several reasons. Firstly, the design of the BBS allows us to sample all habitats, rather than just farmland and woodland. This means that species such as Song Thrush and Starling, which we know to have been declining on farmland for some time and which use urban and suburban sites extensively, can be more effectively monitored. Secondly, the BBS uses a random sampling strategy and therefore achieves a more complete and representative coverage of the UK, again improving the accuracy of our monitoring. We have been running the two surveys concurrently in order to obtain a period of overlap in the two data series. This will enable us to link the population indices generated by the two schemes and to produce an unbroken index for many species extending back to 1962.

The CBC will cease to run as a national monitoring scheme after the 2000 breeding season — as those of you who read David Noble's article "End of an era? Common Birds Census — the final year" in *BTO News 227* will know — and the BBS will take over. However, there is a great deal of potential for CBC-type surveys to be used in other ways and we see this as an opportunity to expand upon its usefulness in the future. Of course all the data already collected over the past 30-plus years will continue to be extremely important, both in linking indices with the BBS data and in their own right for research projects.

TERRITORY MAPPING

The CBC is a mapping census. CBC volunteers select a patch of farmland or woodland that is typical for their area, and survey the plot eight or more times each breeding season, mapping all birds that they come into contact with. Species maps, showing the contacts with each species during all the visits, are compiled and analysed to assess the number and positions of territories held by each species. Mapping censuses provide us with very detailed information about the numbers, location, habitat preferences and density of birds.

We have so far received 212 CBC returns for 1999. Table 1 shows the geographical distribution and habitat composition of CBC plots used in calculating the population indices. Woods and farms are represented about equally. There is a slight bias towards south and east England for CBC plots, reflecting the higher availability of volunteers in these regions.

SIGNIFICANT CHANGES

The results of the 1998 to 1999 comparison are shown in Table 2 for all plots, and Tables 3 and 4 respectively for selected species for which we have presented the results for farmland and woodland plots separately. These species are those that show a slightly different long-term trend on farmland and woodland.

There were 16 species that showed significant population changes on all CBC plots that were surveyed in both 1998 and 1999. Fourteen of these increased. These changes are significant in the sense that the 95% confidence limits both show the same directional component as the estimate of the trend shown — we are therefore 95% sure that the increase or decrease is a genuine indication of population change rather than just a chance event. The only significant decreases were for Red-legged Partridge and

TABLE 1. Geographical distribution and habitat composition of plots used in the 1998-99 comparison.

	Farmland		Woodland		Special		All plots	
Region	No. of plots	%	No. of plots	%	No. of plots	%	No. of plots	%
Southern England	22	30	28	36	8	62	58	35
Eastern England	22	30	16	21	1	8	39	24
Western England	11	15	9	12	1	8	21	13
Northern England	12	16	14	18	2	15	28	17
Wales	4	5	3	4	0	0	7	4
Scotland	2	3	6	8	1	8	9	5
Northern Ireland	1	1	1	1	0	0	2	1
Totals + % of all plots	**74**	**45**	**77**	**47**	**13**	**8**	**164**	**100**

TABLE 2. Population changes as measured by the CBC on all habitats, 1998-99.

Species	25-year trend 1973-98	1998 totals	1999 totals	% change
Little Grebe	⇒	12	12	0 !
Mute Swan	⇑	31	30	-3 !
Shelduck	⇗	30	41	+37 !
Mallard	⇗	299	332	+11
Tufted Duck	⇑	34	32	-6 !
Sparrowhawk	⇑	29	37	+28
Buzzard	⇑	53	59	+11
Kestrel	⇘	63	57	-10
Red-legged Partridge	⇘	82	64	-22 ! *
Grey Partridge	⇓	41	37	-10 !
Pheasant	⇒	427	405	-5
Moorhen	⇒	180	190	+6
Coot	⇒	76	84	+11 !
Lapwing	⇘	77	85	+10 !
Woodcock	⇓	10	12	+20 !
Curlew	⇘	42	38	-10 !
Stock Dove	⇗	149	181	+21 *
Woodpigeon	⇑	1124	1164	+4
Collared Dove	⇑	136	152	+12
Turtle Dove	⇓	54	63	+17 !
Cuckoo	⇘	70	75	+7
Little Owl	⇒	19	20	+5 !
Tawny Owl	⇒	46	48	+4
Green Woodpecker	⇗	123	136	+11
Great Spotted Woodpecker	⇗	145	154	+6
Lesser Spotted Woodpecker	⇓	9	8	-11 !
Skylark	⇓	665	627	-6
Swallow	⇗	226	280	+24 *
House Martin	⇒	78	99	+27 !
Tree Pipit	⇓	28	34	+21 !
Meadow Pipit	⇘	111	127	+14
Yellow Wagtail	⇘	60	56	-7 !
Grey Wagtail	⇒	15	20	+33 !
Pied Wagtail	⇒	104	115	+11
Wren	⇒	3056	3823	+2 *
Dunnock	⇘	968	1045	+8 *
Robin	⇒	2900	3220	+11 *
Redstart	⇑	96	110	+15 !
Blackbird	⇘	2167	2304	+6 *
Song Thrush	⇓	503	541	+8
Mistle Thrush	⇘	150	148	-1
Sedge Warbler	⇒	205	231	+13
Reed Warbler	⇑	423	413	-2 !
Lesser Whitethroat	⇒	48	72	+50 *
Whitethroat	⇒	572	556	-3
Garden Warbler	⇗	242	239	-1
Blackcap	⇗	952	998	+5
Chiffchaff	⇗	821	582	-29 *
Willow Warbler	⇘	1117	1184	+6
Goldcrest	⇓	230	314	+37 *
Spotted Flycatcher	⇓	49	57	+16
Long-tailed Tit	⇒	213	276	+30 *
Marsh Tit	⇓	81	81	0

TABLE 2. Continued.

Species	25-year trend 1973-98	1998 totals	1999 totals	% change
Willow Tit	⇓	17	12	-29 !
Coal Tit	⇒	325	317	-2
Blue Tit	⇒	2212	2151	-3
Great Tit	⇒	1310	1415	+8 *
Nuthatch	⇑	194	183	-6
Treecreeper	⇒	140	159	+14
Jay	⇒	145	133	-8
Magpie	⇗	398	405	+2
Jackdaw	⇗	274	330	+20 *
Carrion Crow	⇗	406	454	+12 *
Starling	⇓	313	303	-3
House Sparrow	⇓	235	262	+11
Tree Sparrow	⇓	16	20	+25 !
Chaffinch	⇒	2601	2642	+2
Greenfinch	⇒	328	377	+15 *
Goldfinch	⇒	176	209	+19
Linnet	⇓	240	299	+2 *
Bullfinch	⇓	152	163	+7
Yellowhammer	⇓	431	449	+4
Reed Bunting	⇓	168	162	-4
Corn Bunting	⇓	38	46	+21 !

Key to Tables 2, 3 and 4

25-year trend, 1973-98:

⇓	= strong decrease	> 50%
↘	= moderate decrease	25 to 50%
⇒	= little change	–25 to +33 1/3%
⇗	= moderate increase	33 1/3 to 100%
⇑	= strong increase	> 100%

Significance:

* significant at the 5% level or above

! small sample size (between 10 and 29 plots)

Species in **bold** are *Birds of Conservation Concern* red-listed or within Tables 1-3 on the list of *Birds of Conservation Importance* (high conservation concern)

Species in *italics* are *Birds of Conservation Concern* amber-listed or within Table 4 on the list of *Birds of Conservation Importance* (medium conservation concern)

TABLE 3. Population changes of selected species in farmland habitats as measured by the CBC.

Species	25-year trend 1973-98	1998 totals	1999 totals	% change
Cuckoo	⇒	39	47	+21
Green Woodpecker	⇗	47	45	-4
Blackbird	↘	1040	1088	+5
Song Thrush	⇓	174	193	+11
Mistle Thrush	↘	67	61	-9
Whitethroat	⇑	397	378	-5
Garden Warbler	⇗	78	77	-1
Willow Warbler	⇒	421	470	+12 *
Goldcrest	↘	38	59	+55 *
Treecreeper	↘	24	36	+50 ! *
Jay	⇒	32	31	-3 !
Greenfinch	⇒	229	275	+20 *
Bullfinch	⇓	40	42	+5
Yellowhammer	↘	352	361	+3

For Key to symbols, see Table 2

TABLE 4. Population changes of selected species in woodland habitats as measured by the CBC.

Species	25-year trend 1973-98	1998 totals	1999 totals	% change
Cuckoo	↘	22	20	-9 !
Green Woodpecker	⇒	68	81	+19 *
Blackbird	⇒	981	1056	+8 *
Song Thrush	↘	289	310	+7
Mistle Thrush	⇒	76	80	+5
Whitethroat	⇒	91	97	+7 !
Garden Warbler	⇒	140	136	-3
Willow Warbler	↘	622	637	+2
Goldcrest	⇓	190	251	+32 *
Treecreeper	⇒	111	115	+4
Jay	⇒	105	97	-8
Greenfinch	⇒	72	72	0
Bullfinch	⇓	98	107	+9
Yellowhammer	⇓	40	46	+15 !

For Key to symbols, see Table 2

Chiffchaff. Chiffchaff was also down on Constant Effort Sites in 1999 (see *BTO News 227*, "Wrens rocketing and Robins bobbin'"), but the reasons for this are unclear. However, Chiffchaff populations have been buoyant in recent years and we expect this bird to bounce back from 1999's losses.

Of the 14 species where indices are shown separately for farmland and woodland (see Tables 3 and 4), Willow Warbler and Treecreeper were additional species that showed significant increases on farmland alone, whilst on woodland plots alone Green Woodpecker was up significantly. Tables 3 and 4 also illustrate that the significant change in Greenfinch populations is attributable to increase on farmland alone.

END OF THE CENTURY ALERTS

Nineteen species monitored by the CBC have shown population decreases of more than 50% during the 25 years 1973–98. Six of these declined by more than 50% in just ten years 1988–98: Tree Sparrow, Grey Partridge, Spotted Flycatcher, Tree Pipit, Willow Tit and Lesser Spotted Woodpecker. We have recently issued high national alerts for these 19 species, based on CBC data. In addition we have issued alerts for Redpoll (not tabulated here because it is now too scarce on CBC plots to have been well monitored in 1998–99) and Whitethroat, which shows a historical decline of more than 50% since 1968 but has been slowly increasing since the early 1970s.

Ten of these species are already red-listed Birds of Conservation Concern. Of these species the numbers of Grey Partridge, Skylark and Reed Bunting were down in 1999 on 1998's totals. Turtle Dove, Song Thrush, Spotted Flycatcher, Tree Sparrow, Linnet, Bullfinch and Corn Bunting all increased in number — Linnet significantly.

As well as these red-listed species, we also issued high alerts for Tree Pipit, Willow Tit, Lesser Spotted Woodpecker, Woodcock, Starling, Goldcrest, Yellowhammer, Marsh Tit and House Sparrow. Of these species, Willow Tit, Lesser Spotted Woodpecker and Starling continued to decrease between 1998 and 1999; Tree Pipit, Yellowhammer and House Sparrow numbers went up slightly and Goldcrest increased significantly. Marsh Tit counts remained about the same.

Although Linnet increased in number significantly between 1998 and 1999, the long-term trend is still downward, as can be seen in Figure 1. Although we are interested in year-to-year fluctuations too, it is the long-term changes in populations that are most relevant for conservation purposes. Year-to-year factors such as particularly harsh or mild winters can have significant short-term effects on populations of birds, particularly small-bodied resident species

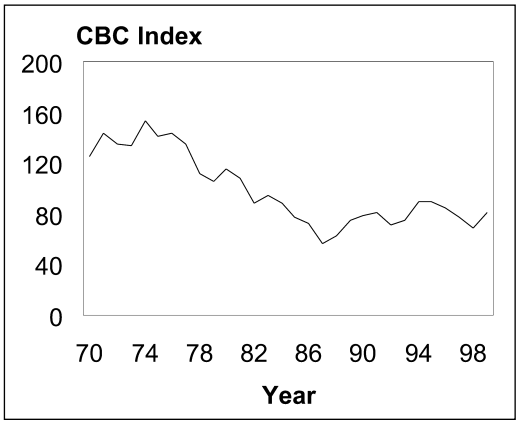


FIGURE 1. CBC index for Linnet, 1970-99.

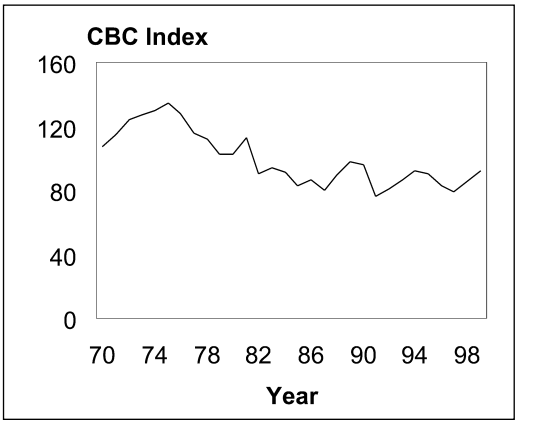


FIGURE 2. CBC index for Dunnock, 1970-99.

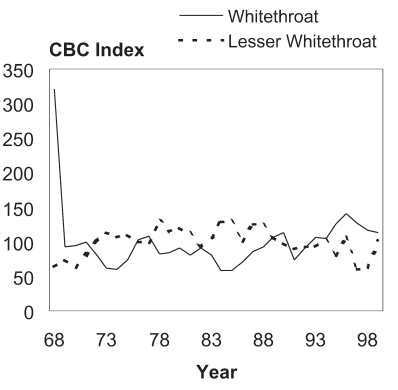
such as Wren and Goldcrest. Although Linnet populations may be stabilising, it is too soon to be complacent with regard to their recovery. The decrease in Linnet populations is linked to an increase in herbicide use, which kills the weeds that they feed on. However, Linnets may benefit from increased sowing of oilseed rape, which they can use as a food source, and from set-aside, a preferred feeding habitat (see *BTO News* 216/217, "The 1996–97 Set-aside project: the final reckoning"). We shall continue to observe populations of this attractive species closely.

WOODLAND BIRDS

Recent research has rightly focused on the dramatic declines in farmland birds since the 1970s. However, the *State of the UK's Birds 1999*

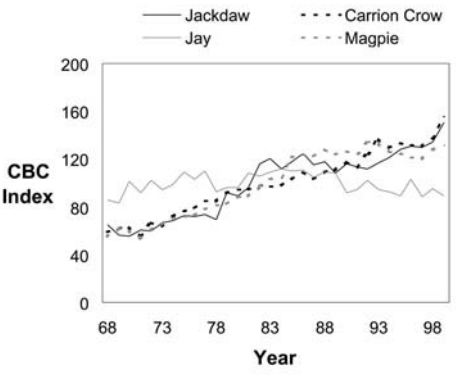
WHITETHROATS' FORTUNES CROSS A CONTINENT

Surely no other two UK birds, taxonomically so close as Common and Lesser Whitethroat, and breeding alongside one another in summer, can boast such striking contrasts in status in the short-term — governed largely, it seems, from different wintering quarters. Formerly one of the commonest of hedgerow species on CBC plots, the Common Whitethroat population plummeted between the 1968 and 1969 breeding seasons, drawing attention to the now well-documented impact of African drought on this and other trans-Saharan migrants, including Sedge Warbler and Yellow Wagtail, that winter largely in West Africa. Common Whitethroat populations have fluctuated around a new lower level following the 1969 crash and subsequent gains have been related to improved rainfall in drought-stricken areas. For Lesser Whitethroat, the CBC has detected a series of population decreases, sometimes between adjacent years (e.g. 38% 1966-67, 22% 1986-87 and, most recently, 43% 1996-97). Population upturns of 30% in 1987 and 50% in 1999 have helped maintain overall stability. Lesser Whitethroats migrate southeastwards in autumn to winter in Sudan and Ethiopia, and have been completely unaffected by the rainfall changes in West Africa. It may be that the periodic and well-publicised rainfall deficits in the Horn of Africa are linked to the population fluctuations we observe, or perhaps spring weather across Europe influences the numbers that reach the UK. These theories deserve further study. *David Glue*



CORVIDS ADAPT BY VARYING DEGREES

Intelligent and versatile, members of the crow family in general have benefited to varying degrees from reduced levels of systematic persecution from game-preserving interests since World War II, as detected for four species with contrasting life-styles by the CBC (see graph). The omnivorous and opportunistic Magpie has increased strongly in numbers in farm, wood and urban habitats alike, since the start of the CBC in the 1960s, though population levels have stabilised in the 1990s. Jackdaw numbers surged from the mid 1970s, and again following mild wet winters of the 1990s. Carrion Crow populations have demonstrated a steady increase as birds have spread into urban habitats and into open and even tree-less country. This corvid trio, along with Rook, have shown a willing ability to exploit foods provided in gardens or on rubbish tips at times of stress during the year, especially while feeding young or in severe winter weather. The arboreal Jay has spilled over increasingly into farmland and some gardens in the breeding season, but a relatively more restricted diet, and generally more cautious nature, may well have contributed towards a population that is generally stable. The CBC population findings for 1999 reflect these general trends in corvid fortunes: Magpie a small increase (2%), Jay a modest reduction (-8%), and increases for Jackdaw (20%) and Carrion Crow (12%) in the combined habitats surveyed. *David Glue*



report shows that woodland birds demonstrate a similar, if shallower, decline over the same period. This is not to say that many of the familiar, common woodland species are not doing well. In 1998–99, Wren, Robin, Dunnock, Great Tit and Long-tailed Tit were all up significantly. Dunnock has been decreasing in population long-term, but Figure 2 shows that this decline may now be levelling out, although this species has clearly been subject to recent short-term population fluctuations. Long-term, species such as Nuthatch, Green and Great Spotted Woodpecker have increased by more than 50% over the last 25 years. Many small woodland residents, particularly species like Goldcrest and Wren, and probably Dunnock, have benefited from the mild winters of the last few years.

However, a variety of woodland species measured by the CBC have shown a downward trend. These include Woodcock, Spotted Flycatcher, Marsh Tit, Willow Tit and Lesser Spotted Woodpecker. It is not clear why these species have declined so substantially whilst others are doing so well. Possible reasons suggested include wet springs affecting breeding success (Spotted Flycatcher) and interspecific competition (between Marsh Tit and other tit species). For farmland birds, agricultural intensification is implicated in the decline of many species, but in woodland species the reasons may be more complex. Hopefully, current and future research by the BTO may elucidate the factors involved.

MANY THANKS

As ever, we are extremely grateful to all our CBC surveyors for their continued hard work. The following observers began new CBCs in 1999: Bedfordshire R Buisson; Buckinghamshire I Bell; Cambridgeshire C Gilbert; R Scott; Lancashire P Kenyon; Lothian I Mitchell; Merseyside P Greenslade; Northumberland D Ogle; North Yorkshire A Shadrack; Nottinghamshire J Nixon.

The CBC is supported by the JNCC.

Bird Populations 6:58-61
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BTO News 231:12-13

YELLOW WAGTAILS SINKING — WATERWAYS BIRD SURVEY'S LATEST POPULATION TRENDS

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Territory mapping surveys carried out by WBS volunteers now cover a quarter-century of population change. *John Marchant* and *Peter Beaven* report the most recent results, including further severe losses for the Yellow Wagtail.

LA LAVANDERA BOYERA SE HUNDE – ULTIMAS TENDENCIAS POBLACIONALES DEL MUESTREO DE AVES EN CURSOS ACUATICOS

Muestreos de mapeo de territorios llevados a cabo or voluntarios del Waterway Bird Survey cubren ya un cuarto de siglo de cambios poblacionales. *John Marchant* y *Peter Beaven* informan sobre los resultados más recientes, incluyendo más graves pérdidas para la lavandera boyera (*Motacilla flava*).

LA BERGERONNETTE PRINTANIERE PLONGE –DENIERES TENDANCES DES POPULATIONS FOURNIES PAR LE WATERWAY BIRD SURVEY

Le recensement des territoires par les bénévoles du WBS couvre maintenant un quart de siècle d'évolution des populations. *John Marchant* et *Peter Beaven* exposent les derniers résultats, qui montrent notamment encore des pertes sévères pour la Bergeronnette Printanière.

SCHAFSTELZEN IM ABWIND – NEUESTE BESTANDSTRENDS AUS DEM FLIEßGEWÄSSER-MONITORINGPROGRAMM

Die Revierkartierungen durch ehrenamtliche Mitarbeiter im Fließgewässer-Monitoringprogramm umfassen nun 25 Kartierungsjahre. *John Marchant* und *Peter Beaven* berichten über die jüngsten Bestandsveränderungen, darunter die anhaltend drastische Abnahme bei der Schafstelze.

The Waterways Bird Survey (WBS) began in 1974. Its observers monitor the numbers of breeding birds along stretches of river and canal by means of a nine-visit mapping census each spring. The great value of WBS is that it extends the monitoring of the UK's breeding birds to a habitat that is poorly represented both by its parent scheme, the Common Birds Census (CBC), and by the BTO/JNCC/RSPB Breeding Bird Survey (BBS). Only waterbird species are included and 24 of these are abundant enough to be monitored. WBS observers are unique in providing monitoring data for Goosander, Kingfisher and Dipper, which are covered by neither CBC nor BBS. Their data are also longer-running or more extensive than CBC and BBS data for a number of other waterbirds, such as Canada Goose, Common Sandpiper and Grey Wagtail. Importantly, WBS results are indicators of the general health of waterways, a vital yet vulnerable element of the UK countryside.

This report covers results for the 1999 season and discusses the population changes detected between 1998 and 1999 and also over a longer

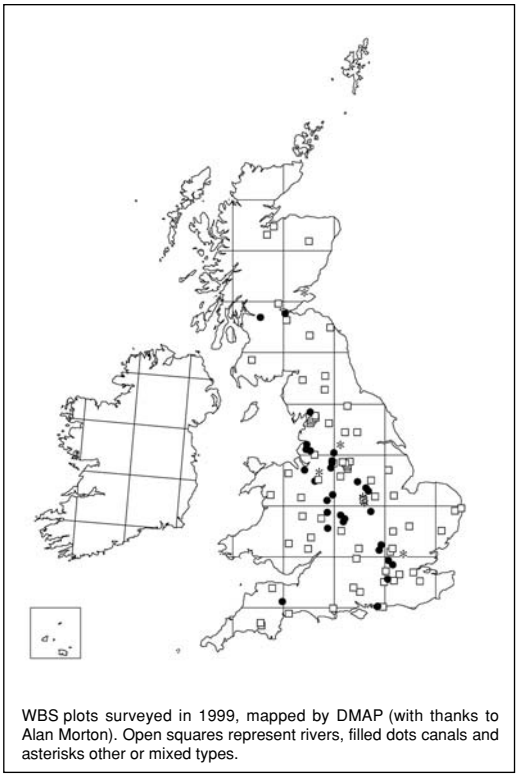
run of years. It follows on from joint reports with CBC in *BTO News* 216/217 and 222.

WBS PLOTS

WBS plots are stretches of linear waterway typically around 4-5 km long. They are chosen by the observers as convenient sites for study. On the River Lune, the Lancaster & District Birdwatching Society has organised coverage of almost the whole length of the river annually since 1974. The Sheffield Bird Study Group is also a major contributor to the survey, with plots on the Derwent and other local rivers, some with data from 1973, which was the pilot year for WBS.

In all, 104 WBS plots were surveyed in 1999 (Figure 1). This is a satisfactory total, but compares poorly with 121 in 1998 and with the peak of 134 plots in 1992-93. The distribution of plots is similar to that of the CBC, being concentrated in England, but, within England, the WBS distribution is more northerly. WBS has no current representation in Ireland.

Of the 104, all but six were surveyed comparably in 1998 and 1999 and so contributed to the estimates of annual population change (Table 1). The 98 plots in the index cover a total of 461.5 km of waterway; 65% of the plots were defined as rivers, 29% as canals, and 6% either were river-canal hybrids or were tidal. Most rivers had a gradient of less than five metres per kilometre and so were classed as "slow-flowing".



WBS plots surveyed in 1999, mapped by DMAP (with thanks to Alan Morton). Open squares represent rivers, filled dots canals and asterisks other or mixed types.

FIGURE 1. 1999 WBS plots.

POPULATION CHANGE

Table 2 shows the WBS estimates of population change for the 24 species now monitored, including Greylag Goose, Canada Goose and Goosander that were all included in the WBS tables for the first time last year. It is always risky to speculate on longer-term trends from just one year-to-year comparison. Experience shows that long-term population trends are generally composed of a mixed series of increases and decreases between consecutive years. The trend modeled from the complete run of WBS data is therefore included in Table 2 (except for a few species where the data do not cover this full period), to give a clear picture.

TABLE 1. Plots contributing to the estimates of population change 1998-99.

	Fast-flowing rivers	Slow-flowing rivers	Canals	Other or mixed types	Totals
Southern England	3	11	3	0	17 (17%)
Eastern England	0	12	8	3	23 (23%)
Western England	4	7	7	1	19 (19%)
Northern England	6	9	8	1	24 (24%)
Wales	1	3	0	0	4 (4%)
Scotland	4	4	2	1	11 (11%)
Totals	**18 (18%)**	**46 (47%)**	**28 (29%)**	**6 (6%)**	**98**

TABLE 2. Population change as measured by the WBS, 1998-99, and summary figure for 1975-98.

Species	23-year trend 1975-98 (%)	1998 territories	1999 territories	% change	Number of plots
Little Grebe	-51 *	33	30	-9	14 !
Mute Swan	+67 *	135	136	+1	60
Greylag Goose	–	104	81	-22	15 !
Canada Goose	–	184	232	+26 *	44
Mallard	+190 *	2181	2321	+6	96
Tufted Duck	+48	133	128	-4	38
Goosander	–	60	73	+22 *	26
Moorhen	-11	778	794	+2	84
Coot	+63 *	473	458	-3	58
Oystercatcher	+109 *	177	171	-3	27
Lapwing	+174	146	152	+4	38
Curlew	+77 *	59	59	0	23 !
Redshank	-34	54	45	-17	16
Common Sandpiper	-16 *	119	100	-16 *	23 !
Kingfisher	-14	48	47	-2	42
Sand Martin	+70	1598	1570	-2	26
Dipper	-16	84	84	0	30
Yellow Wagtail	-81 *	29	16	-45 *	14 !
Grey Wagtail	-48 *	124	146	+18 *	60
Pied Wagtail	-49 *	169	176	+4	57
Sedge Warbler	-18	477	555	+16 *	55
Reed Warbler	+71 *	277	284	+3	29
Whitethroat	+63	315	292	-7	62
Reed Bunting	-68 *	291	308	+6	54

* change statistically significant

! small sample size in 1998-99 (between 14 and 25 plots)

Species in *italics* are Amber-listed in *Birds of Conservation Concern;* Reed Bunting is Red-listed

Because the method used truncates the first and last years' data, once the model is fitted, the figures that are quoted cover the period 1975-98.

Of the 24 species, there were equal numbers of increases and decreases in the WBS year totals for 1998 and 1999, but only six species showed a change in numbers that was statistically significant (four increases and two decreases). Further large increases for Canada Goose and Goosander follow the strongly rising trends WBS has detected for these species since 1980 (70% and 110% respectively). Grey Wagtail and Sedge Warbler, for which WBS has shown relatively little change over the years, also increased substantially — as they did also on CBC and BBS plots between 1998 and 1999 (*BTO News* 228 & 230).

Common Sandpipers dropped sharply in numbers, as they did on BBS plots, and may be slipping towards serious national decline. Some local declines in this species are already well documented. Yellow Wagtail appears to be losing its remaining toehold on WBS plots (see Box).

Seven species monitored by WBS are of particular conservation concern, six of them are Amber-listed and Reed Bunting is Red-listed. (Table 2). Redshank, for many years now on the retreat as an inland breeding bird in England, was the only one of these to show a decrease in 1999. The long-term data also show about the same numbers of significant ups and downs (Table 2). The increase in Mallards on WBS is in agreement with trends on CBC and BBS plots, but contrasts with the declining trend on coastal sites in winter revealed by the Wetland Bird Survey. Mute Swan, Tufted Duck and Coot have also increased. Moorhen populations, despite reduced breeding performance in recent years, show no significant population trend.

Trends for water birds on riverine sites do not always agree with trends on habitats monitored by other surveys. Lapwings, for example,

CONCERN FOR UK YELLOW WAGTAILS

The Yellow Wagtail is widespread across Europe and Asia, breeding from Britain and Morocco east to Alaska but our breeding race flavissima is very largely restricted to Britain. The UK therefore bears a particularly heavy responsibility for its conservation. The unremitting and apparently accelerating decline along waterways, highlighted by WBS, should therefore alert conservationists. Both CBC and WBS data are drawn from a small and dwindling number of survey plots, however, and have not been convincing enough in the past to add the species even to the Amber list of birds of conservation concern. BBS results show a significant 29% decline between 1994 and 1999 (*BTO News* 230).

appear to be increasing on WBS sites but are declining on other inland sites such as farmland. Taking only the last 10 years, however, Lapwings have declined by a significant 23% along waterways. Whereas Oystercatchers have increased and spread, Redshank and Common Sandpipers have declined on WBS sites over the 23-year period — the latter significantly.

All three wagtails show strong evidence of declines since 1975. Grey Wagtails, found mainly on upland sites, and Pied Wagtails, which are widespread, have both declined moderately, whereas population declines in the lowland-breeding Yellow Wagtail have been steep enough to trigger a high alert. Reed Buntings show a severe long-term decline of 68%. This species has recently been shown to be experiencing reduced survival rates and breeding performance.

PROVIDING DATA FOR CONSERVATION

WBS data, alongside figures from CBC and BBS, have contributed to recent reviews of bird conservation priorities in the UK and to the headline indicator of wild bird populations, one of just 13 trend-lines selected by the government to indicate the quality of life in the UK. Mapping along waterways has not proved the ideal method, however, for linking bird surveys to conservation along waterways. There have been too few surveys, and they have been poorly distributed across the UK.

The new Waterways Breeding Bird Survey (WBBS) aims to rectify these problems. It uses a BBS-style two-visit transect method, and is pioneering ways of selecting linear waterways randomly. WBS observers are playing a major part in the WBBS pilot work, by using both survey methods on their existing plots. WBBS began in 1998. Next spring, we will be reporting to the Environment Agency on the performance of WBBS for breeding bird monitoring and on how it relates to the results of River Habitat Surveys made by Agency staff alongside WBBS on its sample of random waterways.

We envisage that WBBS may become an ongoing supplement to population monitoring via BBS and also a standard method for bringing breeding birds into assessments of conservation value along waterways. The future direction of the BTO's data collection along waterways will depend on the outcome of the new analyses.

THANKS

The contributions of willing volunteers are vital to the continuing success of WBS. We are very grateful to all participants. Thanks also to David Noble for comments on the manuscript.

Bird Populations 6:62-63
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BTO News 228:13-14

HERONS IN 1999

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BTO members have kept Grey Heron numbers under annual surveillance for most of the 20th century. *John Marchant* reports on the latest developments.

GARZAS EN 1999

Miembros del BTO han llevado a cabo muestreos anuales de garza real (*Ardea cinerea*) durante la mayor parte del siglo XX. *John Marchant* informa sobre los últimos hallazgos.

LE HERON EN 1999

Les membres du BTO ont suivi annuellement les effectifs de Héron cendré durant une grande partie du 20eme siècle. *John Marchant* expose les derniers développements.

GRAUREIHER 1999

Fast über das gesamte 20. Jahrhundert hinweg wurde der britische Bestand des Graureihers von Mitarbeitern des BTO konstant ermittelt. *John Marchant* berichtet über die jüngsten Entwicklungen.

When Max Nicholson reported on the *British Birds* census of heronries in 1928, he could hardly have anticipated that both he and the census would still be going strong at the end of the century. Since 1933, it has been BTO observers who have charted the ups and downs in numbers of Herons by means of annual counts at as many colonies each year as possible. These counts monitor in effect not only Grey Herons but also, because the species is a top predator at freshwater margins, the general health of the UK's freshwater ecosystems.

REVIEWING THE TREND

1999 was an especially rewarding year for the Heronries Census, because a research grant from NERC has enabled the BTO to catch up with some much-needed curation work. We have used the grant to re-organise the way the survey's information is held on computer and to prepare the data for a more modern way of calculating the long-term population trend. The completeness, reliability and versatility of the computerised data-set have been much improved.

A paper describing the revised population trend in England and Wales is nearing completion. The overall pattern of long-term change has been of shallow increase interrupted by sharp decreases, and a few years of recovery, after an especially icy winter, the last of which was in 1984/85. The population climbed to unprecedented levels during the 1990s. This increase continued in 1999 (see table).

Numbers of Heronries and Heron

Species	No. of sites	1998 total	1999 total	% change 1998-99
England	274	4833	4981	+3%
Wales	47	465	523	+12%
Scotland	36	310	281	-9%
Northern Ireland	16	244	297	+22%
Isle of Man	6	37	37	no change

The data that are tabulated are from a subset of 379 sites that were counted both in 1998 and in 1999. All English and Welsh counties are represented, with the exceptions of Sussex, Northumberland, Radnor, Montgomery, Flint, and Denbigh. Coverage is patchy but improving in Scotland and Northern Ireland. In all, 433 colonies were counted for the Heronries Census in 1999, and 6,888 nests found; the total nest-count is second only to the full national census of 1985, when 700 heronries were counted. The current high population reflects the increased availability of feeding sites for herons, as well as the recent lack of severe winter weather.

PLEASE REPORT NEW HERONRIES

Thanks to the survey's keen counters and efficient regional organisers, more heronries are being counted annually now than ever before. This is good news for monitoring, because with over three-quarters of the estimated English & Welsh population counted each year there can be little room for error in measuring population change. However, we do not want our sample to be biased in any way, for example towards large or long-established sites. To avoid this, we need to be constantly on the alert for new heronries and others that are uncounted.

If you know of a heronry but are not sure whether it is already included in the BTO's census, please send details to your BTO Regional Representative, or to me at The Nunnery. Including more sites, particularly in presently under-represented parts of the UK, will be an effective way of enhancing the already high value of the Heronries Census data.

Bird Populations 6:64-70
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BTO News 230:12-14

THE BREEDING BIRD SURVEY: 1994-1999

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The BTO/JNCC/RSPB Breeding Bird Survey has been highly successful in monitoring populations of our common breeding birds over the last six years. As the number of people taking part increases each year, we are approaching our target of 2,500 squares. *Richard Bashford* and *David Noble* report on the results for 1999 and discuss some of the interesting regional differences in population trends.

EL CENSO DE AVES REPRODUCTORAS: 1994-1999

El Censo de Aves Reproductoras (Breeding Bird Survey) del BTO/JNCC/RSPB ha monitoreado con éxito las poblaciones de nuestras aves comunes durante los últimos seis años. A medida que el número de participantes aumenta cada año, nos aproximamos a nuestro objetivo de 2500 cuadrantes. *Richard Bashford* y *David Noble* informan sobre los resultados de 1999 y discuten algunas de las diferencias regionales interesantes en tendencias poblacionales.

LE BREEDING BIRD SURVEY: 1994-1999

Le Breeding Bird Survey du BTO/JNCC/RSPB a permis de suivre avec succès nos populations d'oiseaux nicheurs durant les six dernières années. Avec un nombre de participants qui augmente chaque année, nous approchons de notre objectif de 2,500 carrés. *Richard Bashford* et *David Noble* exposent les résultats de 1999, et discutent de certaines différences régionales intéressantes en ce qui concerne l'évolution des populations.

DAS BRUTBESTANDS-MONITORINGPROGRAMM BBS: 1994-1999

Das Brutbestandsmonitoring BBS von BTO, JNCC und RSPB war während der letzten 6 Jahre sehr erfolgreich bei der Bestandserfassung der häufigen Brutvogelarten. Aufgrund der anhaltenden Rekrutierung neuer Mitarbeiter ist das Ziel von 2500 Probeflächenquadraten bald erreicht. *Richard Bashford* und *David Noble* berichten über die Saison 1999 und diskutieren einige interessante regionale Unterschiede in den Bestandstrends.

BACKGROUND

In 1994, the BTO/JNCC/RSPB Breeding Bird Survey (BBS) was launched to take over the role of broad-scale bird monitoring from the Common Birds Census (CBC). The BBS uses a line transect method to record birds in randomly selected 1-km squares, twice during the breeding season. The relatively small time commitment necessary to complete a BBS square has allowed large numbers of volunteers to take part.

SURVEY COVERAGE

To date, we have received 2,378 sets of forms for 1999, compared with 2,310 in 1998 (see Figure 1).

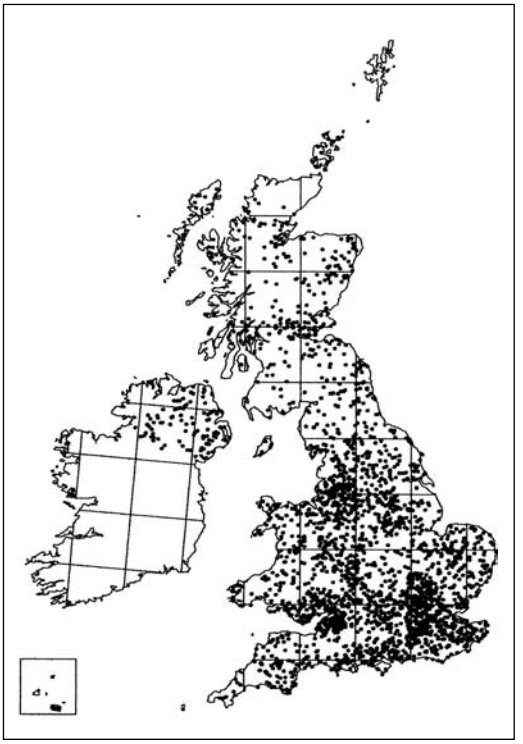


FIGURE 1. The distribution of 1-km squares surveyed in 1999 in England, Scotland, Wales and Northern Ireland.

This slight increase in the overall coverage was expected as many parts of the country have reached optimum coverage, and promotion to expand the scheme is now restricted to a few areas. A second factor is the end of funded professional coverage in Scotland, which had a significant impact on coverage in several Scottish counties.

ENGLAND

The excellent coverage in England increased by 67 squares to 1845 in 1999. Kent tops the list with a staggering 95 squares covered in 1999. Welcome increases in Buckinghamshire (11 extra squares), Cornwall (6), Cheshire (18), Gloucestershire (10) and Sussex (9) ensures that we are able to maintain the high standard of monitoring within the country. We are now routinely publishing a table of population changes for England, for comparison with those for the other countries.

NORTHERN IRELAND

Our coverage in Northern Ireland has improved steadily since the start of the BBS and 95 squares were covered in 1999. Thanks to the generous support of the Environment and Heritage Service of Northern Ireland, 26 of these squares (largely in the west) were surveyed by a professional fieldworker. We now include a table of population changes in Northern Ireland for around 25 common species.

SCOTLAND

Our coverage in Scotland currently stands at 267 squares — down from 307 in 1998. This is because last season was the first year that coverage of remote Scottish squares by professional fieldworkers was withdrawn. When BBS was first started, RSPB agreed to fund coverage in the far north and west of Scotland for the first five years. Around 50 squares each year have been covered by professional fieldworkers, to allow a period for building up volunteer participation in these areas. Given the remote nature of many BBS squares in the far north and west, the loss of 40 squares was not unexpected. However, to monitor Scottish birds to the same degree as elsewhere, we must endeavour to expand coverage in these areas, and so we will be considering other options. Elsewhere in Scotland, coverage was mainly good. Tremendous efforts in Ross-shire and Argyll in 1999 actually resulted in increases in coverage in those areas!

WALES

More vital increases in Wales during 1999 mean that 223 squares are now being covered. Considering that only 137 squares were covered two seasons ago, this represents a dramatic increase, and allows us to monitor a large number of Welsh species with better precision. Most counties in Wales increased by a few squares, and if this continues in 2000, we could reach our target of around 250 squares. Much of this increase is thanks to targeted promotion through the RSPB Welsh Newsletter and by the Welsh Ornithological Society with the help of the BTO's Honorary Wales Officer, Derek Thomas, and with

support from Environment Wales.

SPECIES COVERAGE

Among the 217 species recorded in 1999 are the usual batch of unusual species for the survey including Ring-necked Duck, Yellow-legged Gull and even Black-throated Thrush! With continuing good coverage overall, we hope to gradually increase the number of species we are able to reliably monitor. In 1999, 89 species (including two subspecies) were recorded in at least 100 squares (up by four species from last year) and 13 more were recorded in at least 50 squares. Among the remaining 115 species recorded in smaller numbers on BBS squares are many waders, wildfowl and raptors (a number of which are better monitored by other surveys). It is likely that special surveys will continue to be needed for more cryptic species (e.g. Lesser Spotted Woodpecker and Hawfinch), nocturnal species (e.g. Nightjar) and some uncommon or widely-dispersed species of upland habitats (Ring Ouzel and Twite).

Mammal recording continues to be a popular part of the BBS with 2,016 returns in 1999. The success of BBS mammal monitoring was recently evaluated in a report commissioned by JNCC and it appears likely that the BBS will continue to contribute to a mammal monitoring network in the UK.

POPULATION TRENDS

In keeping with recent changes in government responsibilities and greater emphasis on the UK's individual countries, one of the main developments in BBS over the past couple of years is the breakdown of results by region. We are keen to illustrate the ability of the BBS to provide regional population indices, and in the forthcoming annual report we will be publishing separate tables for England, Northern Ireland, Scotland and Wales as well as for the nine local government Regional Development Agency (RDA) regions of England — North West, North East, Yorkshire and The Humber, East Midlands, East of England, West Midlands, South East, South West and London. This is a major step forward, as local government requirements for data on biodiversity increase, following the implementation of Agenda 21. Note, however, that less common species or those with restricted ranges, are unlikely to be monitored adequately at the regional level.

In Table 1, we present population changes over the last year (1998 to 1999) and for the five year period from 1994 to 1999. Relatively few species have changed significantly in numbers since last year. However, as another year of data is added to the BBS data set, more meaningful medium-term trends are starting to emerge. Of species that exhibited significant population changes between 1994 and 1999, 34 species increased and 25 declined. Among those that have declined are the Biodiversity Action Plan species — Grey Partridge, Turtle Dove, Linnet, Bullfinch and Corn Bunting, whereas Tree Sparrow, Spotted Flycatcher, Reed Bunting and Song Thrush numbers appear to be stabilising — although 1999 levels are still much lower than levels 25 years ago. Skylark continues to decline due to significant decreases in Scotland as well as England. Over the past five years, Swallow, Swift and House Martin appear to be increasing throughout the UK, the latter thanks to considerable increases in Scotland and Wales. Two wagtails — Pied and Grey — have increased, whereas Yellow Wagtail is declining. Meadow Pipits are also declining, particularly in Scotland, whereas populations in Wales and Northern Ireland are flourishing. The pattern for Tree Pipit is the reverse; with significant increases in Scotland and declines in England. With the exception of Marsh and Willow Tit (which has declined by 42% since 1994), most other woodland birds (Green and Great Spotted Woodpeckers, Nuthatch, Treecreeper and certain tit species) appear to be faring well. Small resident species such as Goldcrest, Wren, Robin and Dunnock have also increased in number following another mild winter (Dunnocks especially in Northern Ireland).

Warbler fortunes are mixed. Of ten species monitored by the BBS, three (Lesser Whitethroat, Wood Warbler and Chiffchaff) declined significantly, and two (Willow Warbler and Blackcap) increased significantly. Crows and Jackdaws have continued to increase and numbers are significantly higher than in 1994. However, Magpie populations have stabilised and Jays are declining. Although the House Sparrow has shown a general decline in

TABLE 1. Population changes of common and widespread species 1994-1999.

Species	Sample	Change 98-99	Change 94-99	lcl	ucl
Great Crested Grebe	54	-18	-6	-32	29
Cormorant	130	-13	-5	-21	13
Grey Heron	441	16	14 *	1	28
Mute Swan	159	4	16	-3	38
Greylag Goose	78	47	100 *	46	173
Canada Goose	270	-6	18 *	2	37
Shelduck	110	-13	-40 *	-51	-27
Mallard	874	15	21 *	13	30
Tufted Duck	117	-5	9	-13	36
Sparrowhawk	257	-2	1	-15	18
Buzzard	414	3	29 *	16	44
Kestrel	502	-17	-30 *	-38	-21
Red Grouse	103	-4	31 *	6	61
Red-Legged Partridge	363	-1	16 *	4	30
Grey Partridge	222	-39 *	-43 *	-53	-32
Pheasant	1178	2	1	-4	6
Moorhen	478	19	18 *	6	30
Coot	178	19	33 *	14	56
Oystercatcher	227	0	-18 *	-26	-9
Golden Plover	78	-17	-18	-36	6
Lapwing	525	-1	-20 *	-26	-12
Snipe	117	10	7	-15	33
Curlew	420	-1	-12 *	-19	-4
Redshank	63	-30	-36 *	-51	-16
Common Sandpiper	63	-31	-29 *	-46	-7
Black-headed Gull	425	-11	-36 *	-43	-28
Common Gull	123	-19	-4	-21	16
Lesser Black-backed Gull	399	1	46 *	28	67
Herring Gull	432	-17	0	-11	11
Great Black-backed Gull	85	-11	-22 *	-37	-3
Feral Pigeon	513	-1	10	-1	21
Stock Dove	564	-4	10	-1	21
Wood Pigeon	1751	1	0	-3	5
Collared Dove	941	1	18 *	12	25
Turtle Dove	190	-9	-18 *	-31	-2
Cuckoo	744	-13	-27 *	-33	-20
Little Owl	84	15	-8	-31	23
Tawny Owl	76	22	11	-17	49
Swift	824	15	6	-3	15
Green Woodpecker	507	-3	14 *	3	26
Great Spotted Woodpecker	543	4	42 *	28	58
Skylark	1354	-12 *	-16 *	-20	-13
Sand Martin	92	42	15	-11	48
Swallow	1353	8	10 *	5	16
House Martin	688	29 *	29 *	18	41
Tree Pipit	119	-7	21	-1	48
Meadow Pipit	609	-11 *	-7 *	-12	-2
Yellow Wagtail	155	-19	-29 *	-41	-14
Grey Wagtail	138	67 *	40 *	14	73
Pied Wagtail	907	6	18 *	9	27
Wren	1698	15 *	17 *	13	21
Dunnock	1414	5	7 *	2	13
Robin	1641	7	12 *	8	16

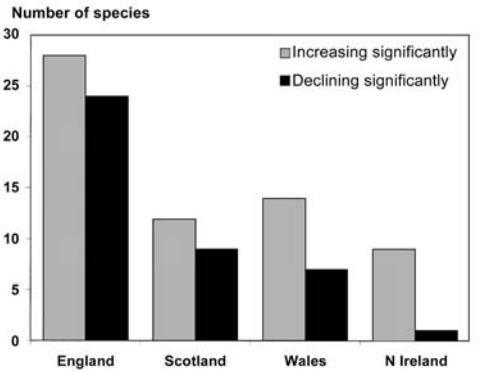
TABLE 1. Continued.

Species	Sample	Change 98-99	Change 94-99	lcl	ucl
Redstart	128	-4	37 *	13	66
Whinchat	82	-23	-9	-28	16
Stonechat	66	30	80 *	32	147
Wheatear	234	-29 *	3	-11	18
Blackbird	1724	9 *	12 *	9	15
Song Thrush	1316	7	6	0	11
Mistle Thrush	907	-1	-4	-12	4
Grasshopper Warbler	59	-51 *	-3	-34	41
Sedge Warbler	233	19	14	0	31
Reed Warbler	82	-10	15	-7	42
Lesser Whitethroat	195	17	-31 *	-42	-17
Whitethroat	932	-6	6	0	14
Garden Warbler	364	11	13	0	28
Blackcap	971	6	50 *	41	60
Wood Warbler	58	-4	-45 *	-60	-24
Chiffchaff	882	-30 *	-7 *	-13	-1
Willow Warbler	1201	-9 *	14 *	9	19
Goldcrest	490	10	61 *	47	76
Spotted Flycatcher	194	19	-11	-25	6
Pied Flycatcher	42	-3	-13	-38	22
Long-tailed Tit	587	24	15 *	3	29
Marsh Tit	115	5	23	-3	56
Willow Tit	60	-16	-42 *	-58	-18
Coal Tit	510	-18	2	-7	13
Blue Tit	1613	0	7 *	3	11
Great Tit	1460	-2	12 *	7	18
Nuthatch	270	-10	14	-1	32
Treecreeper	260	19	41 *	21	65
Jay	480	4	-15 *	-24	-5
Magpie	1335	1	4	0	9
Jackdaw	1120	10	21 *	14	28
Rook	971	0	8	0	17
Carrion Crow	1639	4	12 *	7	18
Raven	150	-15	15	-9	44
Starling	1420	9	-6	-11	0
House Sparrow	1187	0	-7 *	-11	-3
Tree Sparrow	132	21	11	-10	36
Chaffinch	1730	0	3	0	6
Greenfinch	1227	6	20 *	13	27
Goldfinch	962	9	1	-6	9
Siskin	111	-1	6	-16	35
Linnet	982	-3	-14 *	-20	-7
Lesser Redpoll	118	-24	-18	-35	5
Bullfinch	432	-1	-28 *	-37	-19
Yellowhammer	982	0	-16 *	-20	-11
Reed Bunting	322	15	5	-7	18
Corn Bunting	148	28	-26 *	-37	-13

Key to Table 1

Population changes of widespread species 1998-1999 and 1994-1999. The sample size indicated is the mean number of squares occupied each year over the six year period (excluding squares where the species was recorded in only one year). The figures presented are the percentage changes in population levels for the respective time periods, those marked with an asterix were significantly different at a 5% level. For the 1994-1999 period, the lower and upper 95% confidence intervals (ucl, lcl) are given. Species in **bold** are red-listed, and species in *italics* amber-listed in *Birds of Conservation Concern.*

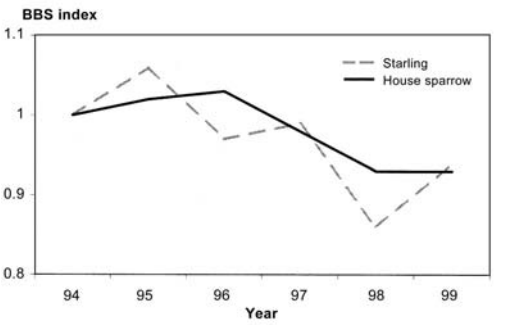
BOX 1. NATIONAL TRENDS



In the country tables in the annual BBS report, we report trends for all species detected in at least 30 squares within the region. Of 57 species in Scotland, nine species showed significant declines and 12 significant increases over the period 1994 to 1999. Of 52 species in Wales, seven declined significantly, and 14 increased significantly over the same period, and in Northern Ireland, only one species (Mistle Thrush) decreased and nine of 19 increased. Because English squares comprise such a large component of the UK sample, population trends in the UK, tend to reflect those in England. Moreover, some species are now so rare outside England that populations cannot be monitored at all. This applies particularly to species of high conservation concern such as Grey Partridge, Spotted Flycatcher, Turtle Dove and Corn Bunting. Of 97 species in England, 24 species declined and 28 species increased significantly, since 1994. The list of declining species is similar to that for the UK, with the addition of Herring Gull, Tree Pipit, Lesser Redpoll, Reed Bunting and Snipe. Among those showing increases in England, but not in the UK, are Pheasant, Common Gull, Stock Dove and Siskin.

Northern Ireland and England (and hence the UK), this species is stable in Scotland and increasing in Wales. Another urban species giving cause for concern is the Starling, now showing significant declines in England and an even steeper decline in Wales. Of the seedeaters, only Greenfinch has increased over this time period. Bullfinch, Corn Bunting, Yellowhammer and Linnet have declined significantly, and populations of Chaffinch, Goldfinch, Siskin and Reed Bunting appear to be relatively stable. Within the countries, results are mixed. England follows the results for the UK but adds Reed Bunting and Lesser Redpoll to the declining list. In Wales, Bullfinch, Yellowhammer and Chaffinch are declining and Goldfinch increasing.

BOX 2. HOUSE SPARROW AND STARLING



Two familiar urban species — the House Sparrow and Starling — continue to decline on BBS squares. Both species are also experiencing severe (>50%) long-term declines on Common Birds Census sites. The reason for the decline of the once-familiar House Sparrow is unknown and investigations are currently underway. The reasons for the Starling decline has not been confirmed but are thought to be related mainly to changes in land use.

(The BBS index is set to 1 for the 1994 population.)

Chaffinches are increasing significantly in Northern Ireland, but in Scotland, the significant increases for Bullfinch and Linnet that were reported last year have been effectively cancelled by drops in numbers between 1998 and 1999.

Other species which have exhibited significant UK declines since 1994 are Cuckoo, Kestrel, Shelduck, Oystercatcher, Lapwing, Curlew, Redshank, Common Sandpiper, Black-headed Gull and Great Black-backed Gull. The declines in waders, which are particularly evident in Scotland, are related mainly to loss and deterioration of upland and farmland habitats in particular afforestation, the decrease in mixed farming, increased grazing intensity, drainage, and predation pressure. On the positive side, counts of Buzzard, Heron, Greylag and Canada Goose, Moorhen, Coot, Red-legged Partridge and Red Grouse have all increased significantly in the UK since 1994. Among the pigeons, Collared Doves have increased significantly, whereas Stock Dove, Feral Pigeon and Woodpigeon numbers are stable at the UK level. Mallard also shows a significant increase, out of line with the declining trend for this species in the Wetland Bird Survey (WeBS). However, BBS trends of waterfowl may reflect the situation for a different component of the population.

THANKS

We now cover around 2,400 squares. With such large numbers of volunteers taking part in the BBS, and with results for each year coming in, we are accumulating an extremely valuable set of data. This is an exciting time for the survey as we start to explore different ways of making effective use of the data. Although there are a few areas where we need more volunteers, most counties have reached their quota. As this article highlights, we are now increasingly interested in producing results from individual countries and RDA regions. In order to continue these analyses, and for potential future work to produce population trends for specific habitats, it is vital that we endeavour to maintain this level of coverage. Thanks to the large number of volunteer fieldworkers and organisers taking part and their hard work over the last six years, we are now in a position to undertake this work. Congratulations!

Bird Populations 6:71-72
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BTO News 226:8

WATERWAYS BREEDING BIRD SURVEY PROGRESS

JOHN MARCHANT
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1999 was the second season in which BTO volunteers used BBS-style transect methods to census breeding birds along a random selection of waterways in the UK. Pilot work continues in the coming spring. *John Marchant* presents a progress report.

AVANCES DEL MUESTREO DE AVES REPRODUCTORAS EN CURSOS ACUATICOS

1999 fue la segunda temporada en la que voluntarios del BTO utilizaron métodos de transecto tipo BBS para censar aves reproductoras a lo largo de una muestra aleatoria de cursos acuáticos en el Reino Unido. Las actividades piloto continuarán esta primavera. *John Marchant* presenta un informe de los avances hasta el momento.

AVANCEMENT DU WATERWAYS BREEDING BIRD SURVEY

1999 a été la seconde saison au cours de laquelle les bénévoles du BTO ont réalisé des transects de type BBS pour dénombrer les oiseaux nicheurs sur une sélection aléatoire de cours d'eau au Royaume-Uni. Ce travail pilote va se poursuivre ce printemps. *John Marchant* présente un état d'avancement.

FORTSCHRITTE IM FLIEßGEWÄSSER-BRUTVOGELMONITORING

Im zweiten Jahr wurden 1999 die britischen Brutvögel entlang zufallsausgewählter Fließgewässer mit einer BBS-ähnlichen Transektmethode erfasst. Diese Pilotprojekt wird im folgenden Frühjahr fortgesetzt. *John Marchant* berichtet über die Fortschritte.

Waterways are conspicuously important elements of the countryside for birds and other wildlife, and also serve many other interests, including navigation, fisheries and flood prevention. BTO members have for many years been censusing breeding birds along waterways, and relating the results to elements of the habitat, through the mapping method of the Waterways Bird Survey (WBS). It has rarely been possible, however, for bodies such as the Environment Agency that have management responsibilities for rivers and canals to make use of the BTO data on birds in assessing conservation priorities.

The arrival of the BTO/JNCC/RSPB BBS in 1994 and the subsequent adaptation of its simple transect census methodology for use along rivers and canals have opened up an opportunity for breeding bird data along rivers and canals, collected by BTO volunteers as part of an ongoing UK-wide scheme, contributing not only to monitoring population levels of waterbirds (as WBS has since 1974) but also, through links to the Agency's River Habitat

Survey (RHS), directly to the conservation management of waterways. So far, the Agency has funded a pilot project in 1998 and a continuation in 1999-2000, with final reports due in spring 2001. Future funding after this year's field season is still to be finalised.

Aims and some initial results of the 1998 work were presented in *BTO News* 221: 8-9. In brief, the pilot work in 1998 was highly successful. It established that volunteers could be found for such surveys and that the numbers of birds counted were high enough to form a valuable monitoring sample. In all, stretches were surveyed in the first pilot year. Far more waterbirds were found than on equivalent numbers of BBS squares, confirming that WBBS could be valuable as a supplement to the national population monitoring function of BBS. In a separate part of the pilot project, links were demonstrated between RHS habitat variables and bird numbers; this confirmed the value of WBBS in augmenting the conservation function of RHS, although the study sites were all canals and were not a representative sample of waterways in general.

WBBS PHASE 2

The main aims of the continuation of pilot work for a further two years are:

- to investigate the power of WBBS for measuring population change, in comparison with the results of WBS and BBS; and
- to make a more thorough investigation of the links between WBBS counts and RHS habitat data, using a large random selection of waterway stretches.

To these ends, two sets of BTO observers were asked to contribute to WBBS in 1999 and to participate again in 2000. First, the BTO's regional organisers were asked to find observers to cover a random set of stretches that includes all those surveyed in 1998 and a few more. We are still looking for new observers to cover many of these in 2000. Second, all observers who currently contribute to the mapping WBS have been asked also to provide a set of WBBS counts for their stretch. In addition, the Environment Agency is arranging for all stretches surveyed for WBBS in any of the years 1998-2000 also to be surveyed for RHS by their accredited surveyors.

By the end of Phase 2, we hope to have a large sample of random WBBS stretches covered for two or sometimes three successive seasons. These will provide estimates of population change, and information on the precision of these estimates, that can be compared with the data provided independently by WBS and BBS. WBS observers using both methods on their plots will provide special insight into the WBS-WBBS comparison. We hope there will also be RHS and WBBS data, even if only for one year, from a high proportion of the 260 random stretches.

CAN YOU HELP?

Like BBS itself, WBBS requires a habitat-recording visit and two bird counts, one early and one late in the breeding season. Mammal counting is also encouraged. If you have already been involved in WBBS counting, we would like you to consider it high priority to continue with it in 2000. Many thanks indeed for your contribution so far! New observers are also needed, to cover stretches that have not yet been surveyed. A single year's coverage in 2000 will be very useful. Please offer your help to your BTO Regional Representative, as soon as possible, or if necessary direct to me at The Nunnery.

Bird Populations 6:73-77
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BTO News 227:10-12

WRENS ROCKETING AND ROBINS BOBBIN'

DAWN BALMER AND CHRIS WERNHAM
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Dawn Balmer and *Chris Wernham* of the BTO's Demography Unit report on population changes on Constant Effort Sites 1998-99. Weather conditions during the 1999 breeding season were very similar to those in 1998 and have resulted in mixed fortunes for Britain's common songbirds. Early nesting residents took advantage of the mild conditions in March and April and successfully fledged young. For other species, the generally unsettled weather and the particularly heavy downpours in late May and June probably adversely affected breeding success.

EL CHOCHIN SE DISPARA Y EL PETIRROJO FLUCTUA

Dawn Balmer y *Chris Wernham* de la Unidad de Demografía del BTO informan sobre los cambios poblacionales en los Sitios de Esfuerzo Constante (CES) en 1998-99. Las condiciones atmosféricas durante la temporada de cría de 1999 fueron muy similares a las de 1998 y han tenido consecuencias variadas para las especies canoras comunes del Reino Unido. Las reproductoras residentes que anidaron pronto se benficiaron del clima templado de marzo y abril y sacaron adelante sus nidadas con éxito. Para otras especies, el mal tiempo y las fuertes lluvias de finales de mayo y junio seguramente afectaron adversamente el éxito reproductivo.

LES ROITELETS EXPLOSENT ALORS QUE LES MERLES HESITENT

Dawn Balmer et *Chris Wernham* de l'Unité Démographie du BTO exposent les changements de populations sur les Constant Effort Sites en 1998-99. Les conditions météorologiques pendant la saison de reproduction de 1999, très proches de celles de 1998, ont conduit à des destins mitigés pour les oiseaux communs de Grande Bretagne. Ceux qui nichent tôt, avantagés par les conditions douces de Mars et Avril, ont élevé leurs jeunes avec succès. En revanche, le temps généralement changeant et les pluies particulièrement importantes de fin Mai et Juin ont probablement diminué le succès reproducteur des autres espèces.

ZAUNKÖNIGE MIT SATZ NACH OBEN, ROTKEHLCHEN MIT AUF UND AB

Dawn Balmer und *Chris Wernham* von der BTO Demography Unit berichten über die Bestandsveränderungen auf den Dauerfangflächen 1998-99. Die Witterungsbedingungen während der Brutsaison 1999 waren denen des Vorjahres sehr ähnlich und führten zu sehr unterschiedlichem Bruterfolg bei den einzelnen Vogelarten. Frühbrütende Standvogelarten nutzten die meist milde Witterung im März und April zu erfolgreichen Bruten. Bei den anderen Arten beeinträchtigte dagegen das generell unbeständige Wetter und vor allem die starken Regenfälle im Mai und Juni den Bruterfolg erheblich.

The Constant Effort Sites (CES) scheme, now running for 19 years, uses catches from standardised mist-netting to monitor changes in the abundance and productivity of common breeding songbirds. Licensed ringers at over 130 sites throughout Britain and Ireland erect mist-nets in the same positions and for the same length of time, during twelve visits spread between early May and late August each year — a real labour of love by dedicated ringers! Changes in the total number of adults caught provide a measure of changing population size, while the proportion of young birds caught is used as an estimate of breeding success. We also use retraps of adult birds ringed in previous years to estimate annual survival rates. Recent advances in analyses mean that we can now calculate long-term trends in numbers, productivity and survival rates from CES information.

CONTINUED GROWTH OF CES

The number of sites operated continues to grow steadily, reaching a new peak of 133 in 1998. By mid-January, we had received ringing returns from 121 sites operated in 1999 and we expect more returns in the next few weeks. Five sites were operated for the first time in 1999 including new sites in Ireland and two in Lancashire.

The results we present here are based upon standardised catches at 112 sites which were operated in the same way in both 1998 and 1999, and at which at least eight visits were completed in both years. The breakdown of habitats covered has not changed much from year-to-year. In 1999, of these 112 sites, 61 were located in reedbed or wet scrub, 39 in dry scrub and 12 in deciduous woodland (a small increase in woodland sites).

SEDGE WARBLERS UP

Another mild winter probably enabled many of our resident species to survive in reasonable numbers, although Wren was the only resident species to show a statistically significant increase

TABLE 1. Changes in captures on CES sites from 1998 to 1999.

	ADULTS				JUVENILES			
Species	No. Sites	Total 1998	Total 1999	% Change	No. Sites	Total 1998	Total 1999	% Change
Wren	98	618	690	+12 *	98	1567	1771	+13 *
Dunnock	99	575	611	+6	99	762	975	+28 *
Robin	94	463	498	+8	99	1655	1718	+4
Blackbird	97	799	798	0	94	600	594	-1
Song Thrush	88	262	247	-6	73	201	216	+8
Sedge Warbler	73	992	1115	+12 *	74	1503	1620	+8
Reed Warbler	61	2012	1971	-2	69	1937	2402	+24 *
Lesser Whitethroat	42	79	81	+3	46	146	90	-38
Whitethroat	70	316	294	-7	75	507	432	-15
Garden Warbler	74	347	329	-5	73	382	280	-27 *
Blackcap	94	878	878	0	94	2118	1522	-28 *
Chiffchaff	81	442	255	-42 *	97	1542	939	-39 *
Willow Warbler	94	1855	1552	-16 *	97	2856	2340	-18
Long-tailed Tit	87	444	418	-6	84	950	990	+4
Blue Tit	98	710	604	-15 *	99	1725	1455	-16
Great Tit	96	473	456	-4	99	1201	1002	-17 *
Treecreeper	48	66	69	+5	71	163	178	+9
Chaffinch	86	517	496	-4	73	270	297	+10
Greenfinch	53	194	205	+6	32	61	95	+56
Goldfinch	44	79	97	+23	29	70	69	-1
Linnet	22	94	89	-5	18	53	60	+13
Redpoll	12	26	35	+35	6	6	35	+483
Bullfinch	85	517	483	-7	76	377	429	+14
Reed Bunting	69	332	322	-3	57	224	237	+6

n = number of paired sites
Total = number of individuals captured at all paired sites
* = significant change at the 5% level

in numbers. There was a welcome increase in the number of adult Sedge Warblers caught, following two successive years of poor adult catches (1997 & 1998). There were three statistically significant decreases in numbers between 1998 and 1999 for Chiffchaff, Willow Warbler and Blue Tit. The long-term trend for adult Chiffchaff shows an increase, and coupled with fairly good breeding success in 1997 and 1998, the population level is presumably quite high. There is no clear reason for the downturn in adult numbers in 1999, but this could suggest less favourable conditions in their wintering grounds. The decline in catches of adult Blue Tits is perhaps easier to explain as simply a knock on effect of a very poor breeding season in 1998. Given another below average breeding season in 1999, we may see a further decrease in 2000.

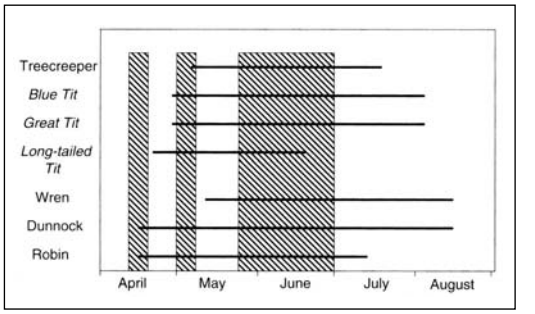


FIGURE 1. Horizontal lines = approximate time when chicks are in the nest (from *A Field Guide to Birds' Nests* by Campbell & Ferguson-Lees 1972); shaded areas = period of unsettled weather and heavy downpour (from weather reports in *British Wildlife* and personal observations in Norfolk). Species in italics are mainly single-brooded

MORE RAIN IN JUNE

The now familiar pattern of mild weather in early spring and unsettled summers, characterised by heavy downpours, resulted in mixed breeding success. Early breeding residents, particularly Wren and Dunnock, took advantage of the mild conditions early on and managed to fledge good numbers of young. Unsettled weather in early and late May, and most of June, made finding sufficient food to feed the chicks difficult. In some areas, cool spells added to the problem and resulted in many chicks starving to death. The heavy downpours caused some localised flooding on Constant Effort sites and wiped out the nests of several ground nesting species, notably Chiffchaff, Willow Warbler and Nightingale. Figure 1 illustrates the period of unsettled weather (shaded area) for much of the country, together with the approximate time when chicks are in the nest (solid line). It is interesting that Blue Tit and Great Tit, both essentially single-brooded species, failed to fledge good numbers of young. The main period that chicks are in the nest coincided with poor weather and may have resulted in few chicks fledging. Another essentially single-brooded species, Long-tailed Tit, breeds slightly earlier than Blue Tit and Great Tit and managed to fledge young successfully. Those species that have more than one brood (e.g. Wren, Treecreeper, Dunnock and Robin) seemed more likely to raise good numbers of young.

Following on from two successful breeding seasons, Blackcap and Chiffchaff both had a poor year. However, the Reed Warbler, one of the latest of our summer visitors to start breeding, had a successful breeding season, benefiting from the mainly dry, sunny weather throughout July and August.

MEASURES OF BREEDING SUCCESS

For the first time we are presenting a new measure of productivity. In the past we have used the percentage of juveniles in the catch to present changes in breeding success. This year we are using the percentage change in juveniles per adult as our measure, which is more in line with the way we present long-term changes in productivity (Table 2). This method is preferable because the amount of change should be directly proportional to true changes in productivity. However, the ratio of juveniles to adults is not a measure of (absolute) productivity because the chances of catching juveniles at Constant Effort sites may differ from the chances of catching adult birds. Rather, the ratio is an index of breeding success. Looking at Table 2, only Blackcap and Redpoll show statistically significant changes. Blackcap is showing a significant decline in productivity (no change in adult numbers but a decrease in juveniles) whilst Redpoll is showing a significant increase in productivity (moderate

TABLE 2. Percentage changes in juveniles per adult caught on CES sites from 1998 to 1999.

	1998		1999		%
	Adults	Juveniles	Adults	Juveniles	change
Wren	618	1567	687	1750	+1
Dunnock	571	756	605	970	+21
Robin	463	1655	498	1715	-4
Blackbird	798	599	798	594	-1
Song Thrush	252	199	233	211	+15
Sedge Warbler	990	1500	1113	1618	-4
Reed Warbler	2012	1932	1963	2395	+27
Lesser Whitethroat	72	133	77	84	-41
Whitethroat	304	498	286	423	-10
Garden Warbler	344	363	323	276	-19
Blackcap	876	2114	878	1522	-28 *
Chiffchaff	432	1513	254	932	+5
Willow Warbler	1844	2839	1550	2339	-2
Long-tailed Tit	427	936	407	972	+9
Blue Tit	708	1711	604	1455	0
Great Tit	471	1198	456	1002	-14
Treecreeper	64	146	64	152	+4
Chaffinch	497	264	489	291	+12
Greenfinch	175	57	189	89	+45
Goldfinch	60	64	77	56	-32
Linnet	89	49	79	54	+24
Redpoll	18	3	35	35	+500 *
Bullfinch	501	373	472	423	+20
Reed Bunting	306	209	321	234	+7

* = statistically significant change at 5% level
Note: the ratio of juveniles per adult gives only an *index* of productivity — see text for further details.

increase in adult numbers but a huge increase in juveniles). The result for Redpoll should be treated with caution because the sample sizes are now very small owing to the scarcity of this species on Constant Effort sites.

New Constant Effort sites are still needed, so if you are interested in joining the scheme please contact Dawn Balmer at BTO for further details. We are particularly keen to encourage new sites in Wales, Ireland, Scotland and south-west England.

The Constant Effort Sites scheme was undertaken within the Partnership between the BTO and JNCC as part of its programme of research into naure conservation.

THANK YOU

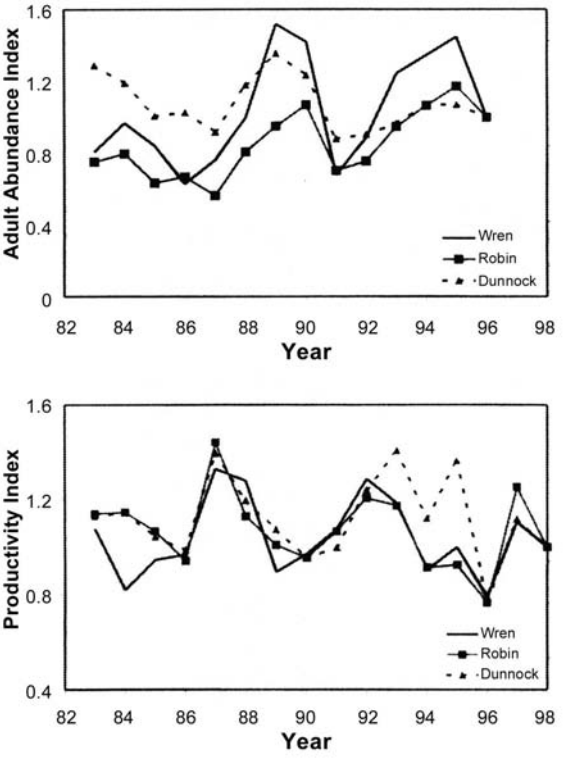
Like all ongoing BTO projects, the CES scheme depends entirely on the enthusiasm, skill and goodwill of its volunteers and we are grateful to all ringers who participated in the scheme in 1999. Whilst space prevents us from acknowledging all CES ringers, we would like to thank the following ringers and groups for their regular contributions: Abberton RG, N Brown, K Bruce, C Butterworth, J Carson, A J Crease, S Dodd, Doncaster RG, G Dunlop,Durham RG, G Etheridge, J Gates, A Goodall, P Grosse, n Harrison, Hersham RG, P R Holmes, Kenfig RG, A Lawrence, R Marsh, D McKee, M McNeely, Newbury RG, North Lancs RG, North Notts RG, Northumbria RG, R Peart, D Roizer, R Shaw, Tees RG, Treswell Wood IPM RG, W Whitehouse, C Wilson. (RG = Ringing Group)

BOX 1. HEALTHY POPULATIONS OF RESIDENT INSECTIVORES ON CONSTANT EFFORT SITES

For Wren, Dunnock and Robin, catches of both adults and juveniles increased between 1998 and 1999 (see Table 1). All CES ringers can easily relate to these year-to-year changes, but they tell us little about the pattern of long-term changes. Long-term trends in adult and juvenile numbers are far more important in conservation terms.

Here we present the trends in abundance for adult Wren, Dunnock and Robin (Peach, Baillie & Balmer, 1998, *Bird Study* 45: 257-275). Catches of adult Wrens increased by 81%, and Robins increased by 82% between 1983 and 1995 (both statistically significant results). These are the largest increases recorded for any of the 28 species monitored by the Scheme. There was a statistically significant decline in the catches of adult Dunnock (-17%) between 1983 and 1995 and the graph shows that catches of Dunnocks have also fluctuated greatly over time. The graphs show the incredible similarity in the shorter term fluctuations for these three resident species. The pronounced fluctuations in catch size can be attributed to unfavourable weather conditions in Britain, for example the severe weather of February 1991 probably accounts for the reduced catches of Wren, Robin and Dunnock in 1991.

We have recently calculated long-term trends in productivity from CES information for 26 species. Productivity has declined for all three species: Wren (-10%), Dunnock (-9%) and Robin (-17%), but this was only statistically significantly for Robin. Patterns in productivity are remarkably similar, although Wrens tend to have a more fluctuating pattern than Dunnocks or Robins. 1996 will be remembered by many CES ringers as a poor year for young birds, and it was by far the worst year for Dunnock and Robin; Wren has reached a similar low level in the past (1984 and 1989). The warm spring conditions in 1987 and 1993 were particularly favourable for breeding. The results of the work on long-term trends in 26 species are currently being written up for publication, and we will tell you more about them in a later edition of *BTO News*. We owe many thanks to Steve Freeman for developing the statistical methods and for carrying out these analyses.



Bird Populations 6:78-80
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BTO News 222:24

PEREGRINES AND BLACK REDSTARTS AMONG NESTING STARS

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David Glue of the BTO's Demography Unit outlines how premature spring warmth, for a third successive year, prompted a spate of early nesting activity in 1999.

EL HALCON PEREGRINO Y EL COLIRROJO
TIZON ENTRE LAS NIDIFICANTES TRIUNFALES

David Glue, de la Unidad de Demografía del BTO, informa de que el prematuro calor primaveral por tercer año consecutivo causó nidificaciones tempranas.

LES PELERINS ET LES ROUGE-QUEUE
NOIRS PARMI LES ROIS DU NICHAGE

David Glue de l'Unité Démographie du BTO souligne comment la douceur d'un printemps prématuré a, pour la troisième année consécutive, déclenché une nichage précoce en 1999.

WANDERFALKE UND HAUSROTSCHWÄNZE
ALS HÖHEPUNKTE DES BRUTGESCHEHENS

David Glue von der BTO Demography Unit beschreibt, wie der frühe Wärmeeinbruch im Frühjahr 1999 wie schon in den beiden vorangegangen Jahren erneut einen Ausbruch vorzeitiger Nistaktivitäten auslöste.

Globally, 1998 was the hottest calendar year in recent times. Daily temperatures 0.6°C above average maintained a worldwide theme of warming allied to climate change, although Britain had bucked the overall trend with a warm start, followed by a destructive chill, then cool, damp weather in June and July. Cold snaps in early November and early December effectively terminated nesting operations of a number of species. Reports included Great Crested Grebes (Merseyside, Surrey), Barn Owls (Essex), Stock Doves (Kent, Gwynedd), Crossbills (Galloway), Mallards and Feral Pigeons (various localities).

NEW YEAR GALES FAIL TO CHECK NESTING ATTEMPTS BY WILDFOWL, OWLS AND THRUSHES

Christmastide 1998 and New Year 1999 passed in unpromising fashion with violent storms, accompanied by torrential downpours, winds gusting widely to 60-80 knots or more. As in early 1998, substantial losses were reported in some areas among stick nest platforms used by Grey Herons and Rooks, but fewer cases involving Red Kites, Goshawks, Buzzards and Long-eared Owls. Many trees were uprooted, including some with cavities used long term by nesting Goosanders, Mandarins, Tawny Owls,

Stock Doves and Green Woodpeckers. Conditions initially remained mild, temperatures peaking at a record-breaking 16°C at Heathrow, London on 6 January. The elements prompted a surprisingly varied outburst of song, display, territory proclamation and nest claiming, involving Kestrels, Sparrowhawks, Jackdaws, Nuthatches, Ring-necked Parakeets, doves and tits. A weak ridge of high pressure brought chilly conditions and short-lived snowfall over much of the country on the 12th. The elements were never severe enough to inconvenience overwintering birds that included Common Crane, Spoonbill, Cattle Egret, Dotterel and Little Stint. However, the wild, wet and windy theme to midwinter soon returned. With no severe frosts from the middle of the month, vigorous nest renovation and building were reported widely among grebes, corvids and doves, while cases of active nests with eggs or young were recorded among Grey Herons (Surrey, Herts), Tawny Owls (Somerset, Manchester), Blackbirds (Oxford), Mallards, Feral Pigeons and Collared Doves (various localities).

FEBRUARY BLOWS HOT AND COLD TO THE BENEFIT OF MANY RESIDENT AND WINTERING BIRDS

A northwesterly airstream dominated throughout February over much of England and Wales, bringing a blend of sunny intervals and wintry showers. Temperatures see-sawed, plunging to -11°C at Aboyne, Lanarkshire on the 8th, but climbing to 15°C at Chester on 14th. Milder interludes more than offset the colder spells. By the month's end, 14 species had been reported to the BTO with active nests. Not too unexpected were those cases in suburbia of free-flying broods of Blackbird (Derby city centre underpass), Song Thrush (Coventry fruit market), Mallard, Woodpigeon and Collared Dove; more so, those instances of egg-laying by Egyptian Goose (Norfolk), Mistle Thrush (Devon), and Robin (Kent). Scotland was less fortunate as persistent northerly winds of arctic origin brought the heaviest snowfalls for a quarter of a century, causing human tragedy on the ski-slopes, as also on mainland Europe. A shivering Continent no doubt contributed towards the higher than usual numbers of Bittern, Rough-legged Buzzard, Great Grey Shrike, Shorelark, and certain wildfowl wintering in Britain. The adverse elements at times in February also contributed to cold weather-related losses among Red Kite, Avocet and Stone Curlew. Most of southern and lowland Britain survived yet another essentially snow-free winter. Not surprisingly, key populations in some sites of Grey Heron, Woodlark, Stonechat, Cetti's Warbler and Dartford Warbler were reported to be at their highest levels for a decade and more.

MID MARCH HEAT SPURS ON NESTING BY WADERS, CORVIDS AND CHATS

March roared in like a lion, as cold northwesterly gales introduced a wintry chill that checked some nesting operations. Conditions were at their worst on the 6th, when afternoon temperatures struggled to keep above freezing. Broods of doves and certain open-nesting passerines, including Dunnock, Song Thrush and Robin were lost. Thereafter, temperatures climbed as high pressure intensified. This further enhanced recent trends towards earlier egg-laying by a broad spectrum of the UK's birds, as detected by the BTO's Nest Record Scheme.

Two warm episodes in the month were noteworthy. That around mid month, when temperatures climbed, reaching 22°C in the southeast, triggered a spate of nest-building by crakes, Magpies, Starlings, Blackbirds and Chaffinches, while clutches were started by Mute Swans, Cormorants, Peregrines, Woodcocks, Woodlarks, Grey Wagtails, among others. At this point, territory-holding Black Redstarts in the London Docklands contrived, temporarily, to halt development of the Millennium Dome. Similarly, Peregrines re-occupied new nesting sites on buildings in towns, cities and industrial complexes, conquering their fear of man while feeding extensively on feral pigeons. The pair breeding on the spire of St John's Roman Catholic church in Bath afforded excellent views for birdwatchers and casual onlookers alike. By the third week migrant Osprey (Highland), Garganey (Humberside) and Wheatear (Dartmoor) were reported back at traditional haunts, and promptly showed

nesting intent, along with modest numbers of pioneer Sand Martin, Chiffchaff and other spring migrants.

By the third week, there was a genuine "spring-like" feel, as temperatures again topped 22°C. Vegetation, aerial insect life (notably butterflies) and amphibian breeding activity, in most regions was some two weeks ahead of normal schedules. Conditions favoured a further surge in egg-laying, at this point involving Lapwing, Peregrine, Stonechat and House Sparrow, while unexpectedly early broods of Heron and Raven were ready for ringing.

SURPRISE EASTER EGGS LAID IN UNEXPECTED PLACES

In pleasant contrast to 1998, a warm, dry Easter at the start of April in most parts further enhanced the nesting prospects of a broad range of residents and a few spring migrants. Blackbird, Robin and Wren were the trio most regularly reported as having benefited from the mild winter 1998/99. Conversely, locally depleted populations of Greenfinch, Linnet and Reed Bunting were major causes for concern. On a positive note, receding floodwater conditions on pasture, marsh, washes and mineral extraction sites, a legacy of the heavy midwinter rains, provided fresh favourable breeding grounds exploited by Avocet, Bittern, Black-tailed Godwit, Little Ringed Plover and Water Rail. Intriguing cases were also noted outside of the limits that were recorded in *The New Atlas of Breeding Birds in Britain and Ireland* for Black-necked Grebe (central England), Gadwall (northwards expansion), Goosander (southern England), Mediterranean Gull (east and west coast expansions), and Red Kite (eastern England).

The inevitable scatter of unexpected nesting places were reported as another season unfolded: Black Redstart in sewage works pumping gear (London), Pied Wagtail aboard mobile ferry (Isle of Wight), Wheatear beneath shoreline driftwood (Pembroke), Oystercatcher on motorway reservation link road (Cumbria).

Overall, even though April continued to blow hot and cold, it was the warmest April since 1987. All was not rosy though, as a bitterly cold spell mid month, saw temperatures drop as low as -7°C, affecting many migrants. Conditions were not as intense or lengthy as in 1998. By May Day, a glorious warm spell, most spring migrants had arrived "on schedule', and pioneer pairs were egg-laying, although it is never wise to take nature's fickle moods for granted.

Bird Populations 6:81-83
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BTO News 225:9

THRIVING MUTE SWANS AND CHILLED PIED FLYCATCHERS

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BTO Research Officer, *David Glue*, describes how extremes of temperature, heavy rainfall, and fluctuating water levels were central to the nesting fortunes of many UK breeding birds in 1999.

EXITO PARA EL CISNE VULGAR Y RESFRIADO
PARA EL PAPAMOSCAS CERROJILLO

El jefe de investigación del BTO, *David Glue*, describe cómo los extremos de temperatura, las fuertes lluvias y la fluctuación de los niveles hídricos fueron determinantes para muchas de las especies reproductoras del Reino Unido en 1999.

LES CYGNES TUBERCULES PROSPERENT ET
LES GOBEMOUCHES NOIRS SONT REFROIDIS

Le chercheur du BTO *David Glue* décrit l'influence importante des températures extrêmes, des pluies abondantes, et des niveaux d'eau fluctuants sur le succès de nidification de nombreux oiseaux nicheurs du Royaume-Uni en 1999.

ERFOLGREICHE HÖCKERSCHWÄNE UND FRIERENDE TRAUERSCHNÄPPER

BTO-Wissenschaftler *David Glue* beschreibt den Einfluss von Extremtemperaturen, starken Regenfällen und Wasserstandsschwankungen auf den unterschiedlichen Bruterfolg britischer Brutvögel 1999.

GREY HERON AND RAVEN GET THE SEASON OFF TO A FLYING START

Following three successive "below par" breeding seasons, the relatively mild, snow and frost-free winter of 1998/99 gave hope for a good year. Early promise was realised as spells of unseasonal warmth in February led to some surprisingly early clutches laid by Egyptian Geese, Ravens and Dippers, while broods of Grey Herons, Tawny Owls and Robins were ready for ringing at the month's end. March maintained the mild theme, and when temperatures topped a creditable "spring-like" 22°C in the third week, a spate of egg-laying included Mute Swans, Cormorants, Peregrines, Mistle Thrushes and Woodlarks. April blew hot and cold in a typically showery fashion. This helped premature nesting operations by certain resident seabirds, waders, owls and passerines. However, wintery showers which swept short lived snow and hail to southern Britain were followed by several damaging night frosts.

Substantial nesting losses were charted among Rooks, Lapwings, thrushes and wagtails. Many tired spring migrants congregated

alongside reservoirs and lakes for vital aerial food supplies, with exhausted and moribund cases involving Sand Martin, Swallow and Yellow Wagtail. The winter legacy of heavy rains created extra wetland habitats, notably flooded pasture, estuarine marsh, washes and mineral extraction sites, attracting cases of breeding Bitterns, Black-necked Grebes, Mandarins, Pochards and Water Rails.

TITS AND PIED FLYCATCHERS HIT BY HEAVY LATE SPRING RAINS

The warmest May since 1964, with temperatures 2-2.5°C above average (a cool N Scotland excepted), and winds often from the southern sector, generally favoured early breeding residents. Conditions initially helped many grebes, crakes, dabbling ducks, corvids (notably Ravens and Jackdaws) and Long-tailed Tits to rapidly raise bumper broods. Little Grebes, Moorhens, Dippers, thrushes and Starlings were soon incubating second clutches. Many spring migrants, until now delayed in part by unsettled cyclonic weather in the Mediterranean basin, flooded back to traditional breeding haunts during warm summer-like spells in May. Observers charted encouragingly high numbers of most hirundines, Wheatear, various warblers, including a further boost for recently depleted Lesser Whitethroat populations. The song period among summer visitors was intense, if somewhat foreshortened. Gales battered northwestern parts in mid May, retarding some nesting operations, notably in coastal habitats. Cooler, blustery conditions, enhanced by periodic torrential downpours, later caused havoc amongst some ground nesting waders, gamebirds, raptors and passerines. Wet, windy and relatively sunless weather over the first eight days of June, further depressed limited food supplies of larval insects (notably defoliating caterpillars), at a critical period for many essentially single-brooded species using nestboxes. Chilled clutches and starved families of Great Tits, Blue Tits, Crested Tits and Pied Flycatchers led to heavy partial brood losses, while Redstart and Nuthatch were affected to a lesser extent. Great Tits and Great Spotted Woodpeckers were regularly observed collecting dislodged caterpillars from the ground, indicative of stressed parents foraging for hungry broods.

MUTE SWAN AND OSPREY AMONG SUMMER POPULATION STARS

Very unsettled, changeable weather, plagued a "far from flaming" June, the coolest since 1991, hindering and helping different birds. Persistent cloud cover, combined with some low daytime temperatures, reduced aerial and larval invertebrate foods, contributing to only modest successes amongst Skylarks, pipits, chats, Chaffinches, leaf and scrub warblers. Displaced Baillon's Crake (Kent), Black-headed Wagtail (Essex) and Waxwing (Shetland), called and sang lustily in establishing territories, sadly failing to attract mates, though Spotted Crake, Savi's Warbler and Serin were more successful. Regular heavy rains ensured another very wet month. Following initial nest losses in spate situations among wildfowl and wetland passerines, many divers, grebes, diving duck, rails, *Acrocephalus* warblers and Reed Buntings benefited from sustained water tables. A thriving Mute Swan population, increasingly spilled over to breed in sub-optimal habitats, including higher tributaries, village ponds, sewage lagoons and quarry pits. The team from the Edward Grey Institute at Oxford University, monitoring the UK's only Mute Swan breeding colony of some 150 pairs at Abbotsbury (Dorset), caught and counted an "all-time high" post-breeding assemblage of 915 birds. Large flocks elsewhere are taken as further evidence of the beneficial effect of banning the use of lead shot by anglers from the late 1980s. Welcome brief interludes of high pressure in early June, followed later by glorious summer heat when temperatures topped 24°C, provided a welcome respite for hunting raptors, among others. The resurgent Red Kite population continued to flourish, topping 300 breeding pairs for the first time in the modern era. A handful of young were taken from the prolific Chiltern population, now yielding two free-flying kites per nesting pair, and released in Yorkshire to speed the recolonization process. Intriguingly, the first of 24 Scottish-born young Ospreys reared and released at Rutland Water since 1996 returned sooner than predicted, having matured in Africa. Where will the first Osprey

nest in England since their disappearance in 1842, — Rutland, in the Border region, or elsewhere?

HOBBY AND QUAIL FLOURISH IN SIZZLING LATE SUMMER HEAT

Temperatures in early July quickly soared and were sustained for periods at a summer-like 26-28°C countrywide, culminating in the hottest July since 1995. This helped to bolster aquatic and flying insect and soil invertebrate food supplies. Great Crested Grebes, Little Ringed Plovers, Stone Curlews, Nightjars, Wrens, Robins and Woodlarks regularly raised second broods. Hobbies arrived in some force in 1999 with pre-breeding feeding assemblages of 20 plus birds at some water bodies. This resulted in pairs breeding in fresh haunts, with broods of three young regularly reported. Interestingly, pairs have followed Peregrines into suburbia, nesting in parkland and exploiting House Martins as primary prey. Little Egrets further strengthened their breeding toehold. Quail bred widely in highest densities since 1986, and lucky observers watched broods in barley, set-aside and oil seed rape, as well as on allotments, fens and industrial waste ground.

Successive mini heatwaves throughout July, led increasingly to parched habitats and lower water tables, creating less favourable breeding conditions for many birds, as most regions received just one-third of the expected monthly rainfall (less than one-tenth in the southeast). The breeding season for many species faded somewhat in early August as temperatures topped 33°C. The following weeks brought disruptive downpours, with localised flooding, further exasperating the situation. Breeding activity remained "low key" thereafter into September, despite glorious Indian Summer heat. Barn Owls, House Martins, Greenfinches and Corn Buntings successfully raised second broods, while some Stock Doves, Swallows and Blackbirds tended third sets of young. Overall, although far from an outstanding season, conditions in 1999 helped to eclipse memories of the wicked summer of 1998, which was easily the poorest in the 1990s for many of the UK's breeding birds.

Bird Populations 6:84-87
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BTO News 234:8-9

YELLOW WAGTAIL AND RED-THROATED DIVER — NEW NEST RECORD SCHEME ALERTS

HUMPHREY CRICK, MIKE RAVEN, PETER BEAVEN AND DAVID GLUE
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Humphrey Crick, Mike Raven, Peter Beaven and *David Glue* report from the BTO's Nest Record Scheme and alert the Joint Nature Conservation Committee to the declining nesting success for eight species and call for more members to record nests for the scheme.

LAVANDERA BOYERA Y COLIMBO CHICO –
NUEVAS ALERTAS DEL PROGRAMA DE NIDOS

Humphrey Crick, Mike Raven, Peter Beaven y *David Glue* informan sobre el Programa de Registro de Nidos del BTO y alertan al Comité Conjunto de Conservación de la Naturaleza (JNCC) sobre el declive en éxito nidificador en ocho especies y hacen un llamamiento a los miembros para aumentar los registros para el programa.

BERGERONNETTE PRINTANIERE ET PLONGEON CATMARIN –
NOUVELLES ALERTES DU NEST RECORD SCHEME

Humphrey Crick, Mike Raven, Peter Beaven et *David Glue* exposent les résultats du Nest Record Scheme, préviennent le Joint Nature Conservation Committee de la diminution du succès de nidification de huit espèces, et sollicitent la participation de plus de membres pour enregistrer les nids.

SCHAFSTELZE UND STERNTAUCHER –
NEUE ALARMZEICHEN AUS DEM NISTKARTENPROGRAMM

Humphrey Crick, Mike Raven, Peter Beaven und *David Glue* legen Ergebnisse des BTO-Nestkartenprogramms vor und weisen das JNCC auf den rückläufigen Bruterfolg bei 8 Arten hin; schließlich rufen sie die Mitarbeiter des BTO zu einer verstärkten Beteiligung an diesem Programm auf.

The BTO's Nest Record Scheme (NRS) is unparalleled throughout the world: no other scheme is so well supported by its dedicated volunteers. A testament to this support comes from the value that the JNCC and Country Agencies (Countryside Council for Wales, English Nature, Environment & Heritage Service of Northern Ireland, and Scottish Natural Heritage) place on the scheme, having contributed to its running costs, currently through the BTO/JNCC Partnership, for the past 40 years.

Approximately 500 volunteers and 50 groups of ringers and other birdwatchers contribute records from around 30,000 nests each year (but we always need more volunteers — see the end of this article). We now hold more than one million individual nest histories of which more than 400,000 are held on computer. So, when records are sent in to the BTO they are computerised, analysed and the results fed back to contributors, the JNCC and Country Agencies to help them decide on conservation priorities.

The latest results from the scheme (from 1966-1999) are derived from the analyses undertaken for the web-based report *Breeding Birds in the Wider Countryside 2000* (see *BTO News* 232: 8-9; and http://www.bto.org/birdtrends). We looked at trends over the past 30 years for 74 species, analysed by statistical regression. (The methods and species examined can be found on the web site, where we used data from 1968-1998 for statistical reasons). The key features of the results are described below.

NRS ALERTS: CAUSE FOR CONCERN

Eight species showed significant declines in breeding performance that may be linked to their population declines. These are the subjects of alerts to the JNCC. We have highlighted three of these in the box on p86. The remaining five are described here. The number of years that each has been on the NRS Alert List is provided in parentheses:

Moorhen (8 years): Increasing egg-stage failure rates (from 31% to 40%). This species has shown a population decline of 32% on farmland Common Birds Census (CBC) plots and range contractions in the The New Atlas of Breeding Birds in Britain and Ireland: 1988-91. The species may be suffering from a deterioration in the quality of farm ponds and possibly wider declines in the quality and quantity of wetland habitats on farmland.

Lapwing (5 years): Increasing egg-stage failure rates (from 40% to 49%). National surveys of this species in England and Wales showed a 49% population decline between 1987 and 1998 and breeding performance has been identified as the main demographic driving force behind these population reductions (*BTO News* 224: 14; Bird Study 48: 2-17). This has been associated with the loss of mixed farming, the switch from spring- to autumn-sowing, the conversion of rough grazing to "improved" grassland and the decline in nesting ground food supplies.

Ringed Plover (4 years): Increased egg-stage failure rates (from 56% to 70%). The breeding population size of this species is not monitored annually by any scheme and thus the information from the NRS must be viewed with concern.

Willow Warbler (2 years): Increased chick-stage failure rates (from 18% to 27%). This species has undergone a moderate population decline of 39% over the past 30 years. While previous work showed that declines in survival rates were to blame, impaired breeding performance and productivity (as measured by the Constant Effort Sites (CES) ringing scheme: *BTO News* 233: 10-11) may be having increasing significance.

Red-throated Diver (NEW): Egg-stage failure rates have increased from 13% to 42% since 1980. Although sample sizes are small, this is a species specially protected under the Wildlife & Countryside Act 1981 and is listed as having an unfavourable conservation status in Europe as a whole.

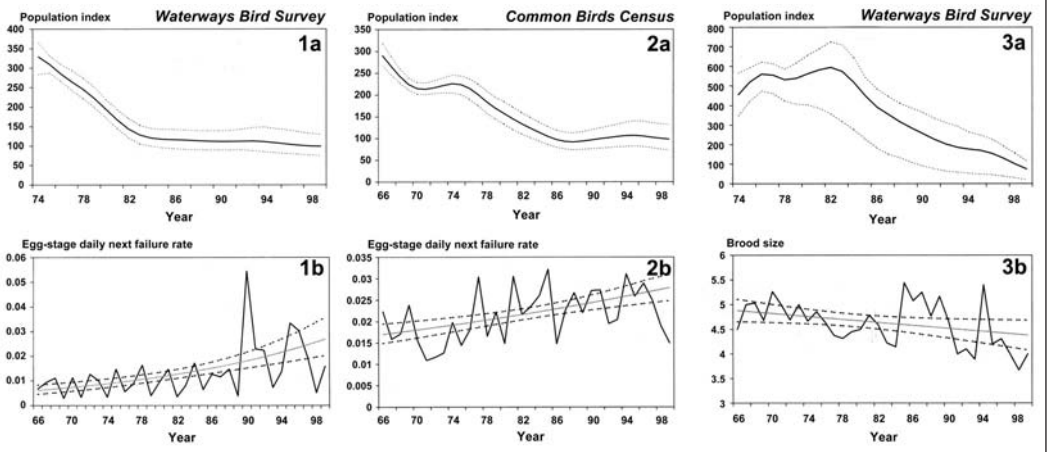
On an upbeat note, several species have dropped off the NRS Alert List because their breeding performance has improved or, in some cases, because the inclusion of 30 years of data (instead of 25 as previously, *BTO News* 228: 8-9) changes the overall pattern of results such that there is no longer a statistically significant decline in breeding performance. This applies to Greenfinch (previously alerted for five years), Meadow Pipit (three years), Yellowhammer, Sedge Warbler and Dunnock (all one year only). The inclusion of longer runs of data increases our confidence in the alerts issued.

"DENSITY-DEPENDENT" CHANGES

One of the rather paradoxical patterns that arise out of NRS data is that breeding performance often tends to improve as populations decline or vice versa. These changes may be the result of so-called "density dependent" changes, in which increased crowding causes greater competition for resources and hence declines in breeding performance, and vice versa. Alternatively, such changes may result from the loss of birds from poorer quality areas as populations decline, or the colonisation of suboptimal breeding areas as populations increase, such that breeding performance, overall, changes.

Thus for clutch size, 15 out of 24 significant trends shown conform to an interpretation of density-dependence. Similarly for brood size, 17 out of 33; for egg-stage failure rates: 18 out of 45;

CHANGES IN BREEDING SUCCESS AND POPULATION SIZE OF REED BUNTING, LINNET AND YELLOW WAGTAIL



Reed Bunting (9 years):
Increasing egg-stage nest failure rates (from 11% to 36%)) may be holding back the recovery of this species. Its population declined by 49% over the past 30 years, suffering from lower survival, perhaps because of lack of winter food supplies on farmland.

Linnet (9 years):
Increasing egg-and young-stage failure rates, which over te whole nesting cycle amounts to an increase from 39% to 53% failing before fledging. Linnets have declined by 59% over the past 30 years and detailed analysis has shown that the increase in egg-stage failure rates was sufficient to have been responsible for the population decline. The cause is currently unknown.

Yellow Wagtail (NEW):
Average brood size for Yellow Wagtails has fallen from 4.85 to 4.40 chicks over the past 30 years. Although the annual sample sizes are relatively small, for this under-recorded species, the pattern of decline is quite clear. Yellow Wagtails have declined in abundance on Waterways Bird Survey (WBS) plots by 81% since 1975 and the causes of this decline need urgently to be addressed (*BTO News* 231:12-13)

(Index set at 100 for 1998 in Figures 1a, 2a and 3a; dotted line shows 85% confidence limits. In Figures 1b, 2b and 3b, the black line shows the annual average values, the grey line is the regression line through the annual values with the dotted line representing the 95% confidence limits of the regression line.)

and for chick-stage failure rates 10 out of 24 conform to an interpretation of density-dependence. Overall, nearly half of the significant trends conform to a density-dependent interpretation.

These trends in breeding performance may be of especial relevance to a small number of species for which we have limited or no information on trends in population abundance, and improvements in breeding performance may actually reflect possible undetected population declines. The species this applies to are:

Ring Ouzel: Reduced failure rates at the chick stage. This species declined in population distribution by 27% between the two breeding bird atlases (i.e. between 1968-72 and 1988-91, as shown in the *The New Atlas of Breeding Birds in Britain and Ireland: 1988-91).*

Stonechat: Increased average clutch and brood sizes, associated with a distribution decline of 15%.

Whinchat: Increased average clutch size, associated with a distribution decline of 16%.

Wheatear: Increased average brood size, decreased egg- and chick-stage failure rates, associated with a distribution decline of 7%.

"GOOD NEWS STORIES"

In addition to the somewhat gloomy stories that inevitably form the bulk of a report aimed at alerting government to declines in breeding performance, there are a number of species for which improvements in breeding performance are associated with population increases. These "good news stories" include several that are somewhat controversial, in particular those

involving corvids and raptors. Thus, omnivorous Jackdaw, Magpie, Jay and Rook all show improvements in aspects of breeding performance, as have predatory Sparrowhawk, Buzzard and Grey Heron. These species have been bolstered by combinations of increased protection, reduced persecution and reductions in chemical pollution.

The seed-eating Collared Dove and Stock Dove have increased in population size substantially over the past 30 years and have also enjoyed improved nesting success. Among the smaller birds, Chaffinch, Woodlark, Robin, Redstart, Nuthatch and Great, Blue and Long-tailed Tits have also enjoyed improved nesting success as their populations have increased. It is quite possible that such changes have helped to drive the population increases for these species, but the factors responsible need to be researched further.

PLEASE HELP!

Although the number of records we receive each year seems large, we constantly need to recruit more volunteers because some helpers drop out each year. Equally important, we receive less than 100 Nest Record Cards per year for some species, making it difficult for us to the monitor them adequately. For example, even relatively common species such as Skylark, Mistle Thrush, Blackcap, Whitethroat, Bullfinch and Reed Bunting fall into this category. So, even if you can record just one nest per year, we really want to hear from you. For information on how to contribute and a free "Starter Pack" including the latest Nest Record News, please contact Mike Raven at BTO Thetford HQ (and by email: mike.raven@bto.org).

We are grateful to all volunteers who send in Nest Record Cards each year.

Bird Populations 6:88-91
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BTO News 231:10-11

BRAMBLINGS AND BULLFINCHES BRIGHTEN LATE WINTER BIRDTABLES

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BTO Research Officer, *David Glue*, draws together the Garden Bird Feeding Survey findings for winter 1999/2000, and takes a look at trends emerging about feeding bird numbers and their behaviour over the last three decades.

PINZONES REALES Y CAMACHUELOS DAN COLOR A LOS COMEDEROS A FINAL DE INVIERNO

David Glue, jefe de investigación del BTO recaba los resultados del Muestreo de Aves en Comederos de Jardín (GBFS) para el invierno de 1999-2000, y examina las tendencias emergentes sobre números de aves en los comederos y su conducta en las últimas tres décadas.

LES PINSONS DU NORD ET LES BOUVREUILS ENJOLIVENT LES MANGEOIRES EN FIN D'HIVER

Le chercheur du BTO *David Glue* regroupe les résultats de la Garden Bird Feeding Survey pour l'hiver 1999/2000, et examine l'évolution de l'effectif et du comportement des oiseaux au cours des trois dernières décennies.

BERGFINKEN UND GIMPEL BRINGEN FARBE AN DIE FUTTERSTELLEN IM SPÄTWINTER

BTO-Wissenschaftler *David Glue* fasst die Ergebnisse des Gartenvogel-Monitoringprogramms aus dem Winter 1999/2000 zusammen, wobei die Veränderungen in den Beständen sowie im Verhalten der Wintervögel an den Futterstellen in den letzten drei Jahrzehnten beleuchtet werden.

When the BTO's Populations and Surveys Committee, as it was then, discussed the need for a project to assess the impact on birds of supplementary feeding within gardens in the late 1960s, a few dissenting voices questioned the wisdom of studying an activity that involved "tampering with nature". Thankfully, the Garden Bird Feeding Survey (GBFS) was set in motion in winter 1970/71. This has enabled the BTO to monitor changes in the relative numbers of UK birds exploiting supplementary foods. At that time, no-one could have anticipated the huge boom in the production and sales of bird care products that would take place in the following years.

BUSIEST AND BAREST OF GARDENS

Countrywide, 279 GBFS householders kept records of the weekly peak counts of all species

coming to take provided food and water from October 1999 to March 2000 inclusive — 120 in rural villages and isolated homes, 159 in towns and cities. Geographically, these sites were spread the length and breadth of the UK and the sample was considered broadly representative of the wide range of gardens. Among them were species-rich and species-poor gardens. The "Top" garden belonged to Geoffrey Gush of Ottery St Mary (mid Devon) who attracted 46 species, including Woodcock and Snipe taking peanut granules. Intriguingly, Collared Doves, Starlings and House Sparrows were absent throughout the winter. At the other end of the scale was the garden of Mr S Harper of Ramsgate (Kent), with House Sparrow (maximum nine) and Greenfinch (maximum seven) dominant among just six species frequenting this coastal garden.

Overall, 80 species took provided food or water. The "Top Twelve" feeders (Table 1) was headed by Blue Tit, the only species to patronize all sites. The remainder of the Top Twelve were the same species as the previous winter, though with small differences in occupancy rates.

Rural gardens, on average, supported only marginally more species in winter 1999/2000 than their suburban counterparts — 20.25 and 19.75 respectively. This paralleled the picture in the previous two winters, which were also mild, often very wet, and at times stormy in nature (*BTO News* 218: 8-9 and 224: 8-9). This contrasts with winter 1995/96, noted for its low fruiting yields and some damaging cold spells with penetrating frosts when more species turned to man for survival at birdtables.

TABLE 1. GBFS Top Twelve garden feeding species, winter 1999/2000.

Rank	Species	% of gardens
1	Blue Tit	100.0
=2	Robin	99.6
=2	Blackbird	99.6
4	Great Tit	97.8
5	Dunnock	97.1
6	Greenfinch	96.7
7	Chaffinch	96.1
8	Collared Dove	89.6
9	House Sparrow	89.2
10	Coal Tit	87.5
11	Starling	86.7
12	Magpie	77.8

MIDWINTER GALES AND MARCH HEAT DEPRESS BUSY BIRDTABLES

Three key factors strongly influenced the range of species and flock-sizes of garden feeding birds:

- Locally, high yields of certain major wild fruits, including beech mast, acorns, haws and domestic soft fruits, ripened by prolonged warm spells in late autumn.
- 1999 was a relatively poor breeding season for many single-brooded tits and some finches, the fourth such season in succession.
- A largely snow-free winter, with lengthy frost-free spells, punctuated by unseasonably warm episodes in November and the first three months of 2000.

Some surprisingly sharp frosts in early October brought family parties of late breeding Woodpigeons, Greenfinches and House Sparrows together at feeding areas. Food hoarding by Coal Tits, Nuthatches and Jays was frenetic by late October. A sunny November, the driest widely since 1988, saw heavy drinking at bird baths by doves, thrushes and finches. Blasts of polar air, accompanied by the first severe winter frosts in mid December and short-lived snowfalls, brought early Siskins, Goldfinches, Bramblings and Reed Buntings to some sites. Winter thrushes remained scarce garden visitors, less so than in winter 1998/99, with Fieldfares outnumbering Redwings (Table 2). Progressively in December mixed thrushes turned to a glut of windfall apples "presented"

TABLE 2. 12 example species, winters 1998/99 and 1999/2000.

Winter	1998/1999	1999/2000
Weather	Stormy, mild & wet	Very mild & wet
No. Gardens	258	279
Species	% gardens	% gardens
Song Thrush	53	55
Siskin	50	55
Goldfinch	49	62
Long-tailed Tit	44	56
Brambling	22	26
Rook	22	20
Jay	22	18
Blackcap	20	24
Black-headed Gull	21	19
Redwing	7	8
Fieldfare	3	9
Redpoll	1	3

at feeding stations, which also attracted Starlings and Blackcaps.

Either side of Christmas, very wet and turbulent weather tended to depress feeding activity. Initially drawn to water and winter midges, Wrens, Grey Wagtails, Goldcrests and Chiffchaffs often turned to fatty products, peanut granules and small seeds. Mild and damp weather in the New Year prompted the need for strict hygiene standards. Several observers were concerned by raiding mammals at feeding areas. From late January, flock sizes of feeding Blackcaps, certain thrushes, Chaffinches and Goldfinches climbed, as supplies of natural foods were exhausted, peaking in early March. Bramblings, Siskins and Redpolls each frequented more birdtables than the previous winter (Table 2). "First-ever" Goldfinches were noted at feeders as far afield as Belfast and Penzance. Flocks topped 185 at Ringshall (Herts) on 2 March. Goldfinch and Long-tailed Tit weekly counts exceeded those of House Sparrow and Blue Tit in some areas, a situation beyond our wildest dreams 30 years ago. Bramblings, Siskins and Fieldfares lingered in some areas into April when Bullfinches and Yellowhammers turned to seed mixes for extra energy prior to breeding.

WOODPECKERS AND SPARROWHAWKS PATRONIZE MORE FEEDING STATIONS

Much positive news emerged in winter 1999/2000. Six species each achieved all-time "high" levels of attendance at feeding stations — Collared Dove (90%), Magpie (78%), Goldfinch (62%), Woodpigeon (60%), Great Spotted Woodpecker (46%) and Goldcrest (17%). The troubled Song Thrush showed a small increase, matching a modest upturn in breeding fortunes in 1999 (*BTO News* 228: 10-11).

Sparrowhawks came to take avian prey at 58% of garden feeding stations, the highest GBFS levels yet. Recorded prey ranged in size from Goldcrests and Long-tailed Tits to Magpies and Woodpigeons, with Blackbird and Collared Dove most frequently taken. Buzzards are becoming increasingly bolder, snatching scraps on the margins of gardens in the Black Mountains, Chilterns, Cumbria and Dartmoor, a pair finally venturing on to the birdtable at Kidwelly (Dyfed).

SURPRISE DEBUTANTES AT GARDEN FEEDING STATIONS

Hoped for predictions that Red Kite might, fittingly, become the 160th species registered in the 30th winter of the GBFS (*BTO News* 224: 8-9) were frustrated by overflying birds (Herts and Greater London), though birds did take meat fragments at nearby "unofficial" gardens. The landmark was eventually claimed by Yellow-legged (Armenian) Gull at Shoreham-by-Sea (West Sussex), following the equally scarce recent additions of Mediterranean and Glaucous Gull. Escapee, exotic cage birds, were a feature of another mild and stormy winter.

Elsewhere, favourably situated gardens attracted exciting species that others of us can only dream of: Stonechat (Gwynedd), Hawfinch (Surrey; South Yorks), Snow Bunting (Ross-shire) and, intriguingly, Lesser Whitethroat (Bristol). The winter also witnessed a substantial influx of Waxwings, approaching 1,600 strong in the New Year, at which time birds were recorded in a South Yorks GBFS garden. The intake was very largely confined to northeast Britain and east coast counties, and in no measure comparable with the memorable irruption of winter 1995/96, the largest in 30 years to reach UK shores (*BTO News* 203: 5).

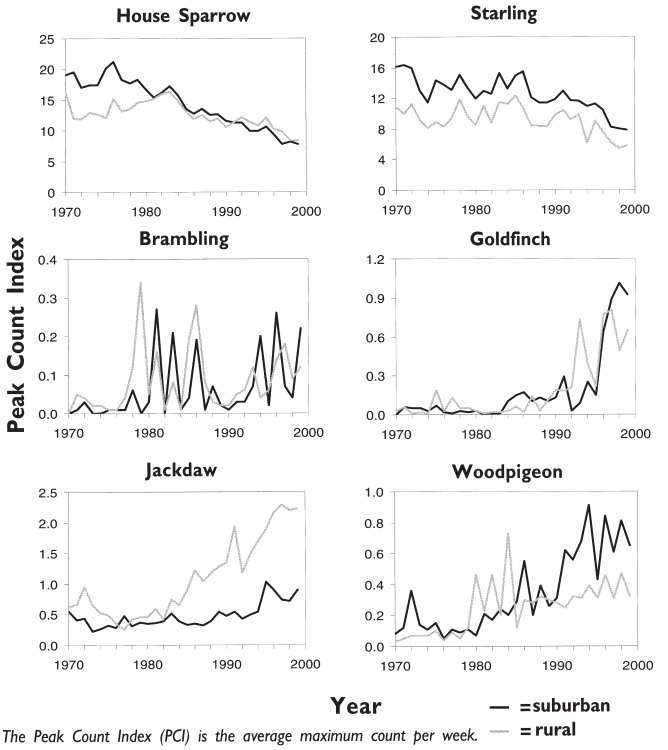
Overflying Golden Eagle and Raven (Kyle, Ross-shire) failed to qualify for the GBFS, but Hen Harrier (IOM), Merlin (Devon, South Yorks) and Barn Owl (Norfolk) harried and caught small birds within feeding areas. One wonders what events may excite GBFS recorders over the current winter.

THANK YOU

SUSTAINING A CAREFUL RECORD

The BTO is extremely grateful to the dedicated team of GBFS counters country-wide who meticulously record their garden birds on a weekly basis each winter. Some exciting major analyses of the 30-year data set are underway. Frances Bowman, Jacky Prior, Carol Povey and Rick Woodburn kindly helped with production of GBFS forms and collation of data.

BOX 1. FLUCTUATING FORTUNES AT GARDEN BIRDTABLES — GBFS PEAK COUNT INDEX 1970-2000



The Peak Count Index (PCI) is the average maximum count per week.

Peak Count Indices (PCIs) in winter 1999/2000 endorsed some interesting emerging trends. House Sparrow and Starling dipped to all-time "low" feeding levels. House Sparrow feeding flock sizes have fallen by over half in suburbia, and fallen by one-third in open country gardens, since peaking following the highly productive breeding season in the hot summer of 1976. More intensive farming methods, less spilt grain, fewer soft invertebrate foods in summer, loss of safe breeding and roosting sites, disease and pollution have all been implicated but remain unproven (*BTO News* 218: 8-9; British Wildlife 10: 381-386, J D Summers-Smith). The dip in feeding numbers of Starlings, a feature of both town and village birdtables, has accelerated in the 1990s. It parallels declines in breeding populations across much of NW Europe, including losses on UK farmland and, most strikingly, woodland CBC plots. Less soft-bodied invertebrate prey, affecting chick mortality, has been suggested as a causal factor. Detailed research is urgently needed to identify the key reasons and, hopefully, reverse the demise of two much maligned UK garden birds.

Bramblings graced many extra gardens late in the winter, as plentiful yields of beech mast were depleted, numbers approaching or eclipsing other recent peak winters for this star visitor, notably 1981/82, 1983/84, 1986/87 and 1997/98. Goldfinch maintained their explosive move into gardens, accelerating in the 1990s. Birds have exploited many extra feeders in towns and cities since winter 1996/97, tempted in part by new blends of sunflower and seed-mixes. Jackdaw and Woodpigeon provide two further modern day success stories, though viewed with mixed blessings by some, notably those with farming interests. Both have shrugged off their rural shyness, entering more gardens in the 1980s, when the latter responded in part to colder winters. Similarly, both have frequented more gardens in suburbia in the 1990s, boosted by population surges.

Bird Populations 6:92-99
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BTO News 235:10-13

2000 — A GOOD YEAR FOR MANY SPECIES

RICHARD THEWLIS, JOHN MARCHANT, DAVID NOBLE AND DAVID GLUE
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The 2000 breeding season was the last in which the Common Birds Census operated as the main tool for monitoring breeding bird numbers in the UK. *Richard Thewlis, John Marchant, David Noble* and *David Glue* report the latest information from the CBC on population change.

2000 - UN BUEN AÑO PARA MUCHAS ESPECIES

La temporada reproductiva de 2000 fue la última en que el Censo de Aves Comunes operó como herramienta principal para el monitoreo de números de aves reproductoras en el Reino Unido. *Richard Thewlis, John Marchant, David Noble* y *David Glue* informan sobre los últimos resultados del CAC sobre cambios problacionales.

2000 – UNE BONNE ANNEE POUR BEAUCOUP D'ESPECES

La saison de reproduction 2000 a été la dernière au cours de laquelle le Common Bird Census a été l'outil principal du suivi du nombre d'oiseaux nicheurs au Royaume-Uni. Ric*hard Thewlis, John Marchant, David Noble* et *David Glue* donnent les dernières informations du CBC sur l'évolution des populations.

DAS JAHR 2000 – EIN GUTES JAHR FÜR VIELE ARTEN

Im Brutjahr 2000 wurde das Monitoring häufiger Brutvogelarten CBC letztmalig als brititsches Haupt-Brutbestandsmonitoring durchgeführt. *Richard Thewlis, John Marchant, David Noble* und *David Glue* geben Auskunft über jüngste Bestandsveränderungen aus diesem Programm.

The Common Birds Census (CBC) is one of the longest-running schemes organised by the BTO. Its volunteers have been mapping breeding territories of common and widespread birds in the UK since 1962. The data generated by the CBC are used in a variety of ways to promote bird study and conservation. Its long-term data for common birds have quantified trends that otherwise would have remained conjecture, and brought the declines among farmland birds to the forefront of conservation thinking and also to the attention of the general public.

CBC results were an important component of the second, 2000 edition of the *State of the UK's Birds*, published earlier this year by RSPB, WWT and BTO. CBC provided a large input to the national wild bird indicators, published jointly by DETR, RSPB and BTO last autumn. The CBC has also been virtually the only source of data on long-term population trends for ten UK Biodiversity Action Plan (BAP) priority species: Skylark, Corn Bunting, Grey Partridge, Bullfinch, Spotted Flycatcher, Linnet, Reed Bunting, Turtle Dove, Song Thrush and Tree Sparrow. The report on Breeding Birds in the Wider Countryside 2000, disseminating BTO survey results worldwide on-line at www.bto.org/birdtrends, draws

heavily on CBC data.

The territory maps themselves, on file at BTO HQ in Thetford, are constantly in use by researchers investigating a range of species-, or habitat-based topics. It is however the CBC's trend data that are reported here.

SOME CBC STATISTICS

The CBC archive represents a massive co-operative effort by around 2,000 observers in total over its 40-year history. We are still adding to the CBC files. So far, however:

- 1,571 different sites have been surveyed
- 10,031 CBC surveys have been compiled, across all years
- 1,977,159 territories have been mapped
- over 100,000 territories are on file for each of the CBC's top five species: Blackbird, Wren, Robin, Chaffinch and Blue Tit

The ten-thousandth CBC survey was completed in 2000. We may reach two million territories in 2001, depending on how many sites have been accessible during the Foot & Mouth outbreak.

LOOKING TO THE FUTURE

The 2000 breeding season was the last year of the CBC as a national monitoring scheme, and these results are therefore an important milestone in long-term monitoring of terrestrial bird populations. CBC is not ending, however, but will continue with redefined aims. Indeed, the CBC's mapping method will continue to be used wherever a survey requires territory maps and fine details of birds' use of habitat.

During the past winter, and with a great deal of heart-searching, we have selected a group of 50-60 plots that the BTO will use its funds to support, in the same way as before, for as long as possible. These "core" plots were selected on the basis of four criteria. The most important was their status, as designated internationally (SPA and SAC) or nationally (National Park, SSSI, National Nature Reserve). So many plots were Local Nature Reserves that we could not use this as a basis for selection. Other considerations were whether plots were particularly suitable for studies of habitat management, whether other demographic surveys were being carried out (e.g. nest finding, ringing) and the period of time that they had been running. Because so many CBC observers have been surveying their plots for more than 10 years, however, plots had to be extremely long-running to qualify automatically.

Observers whose plots were not selected as part of this core group were asked whether they would like to continue surveying their plot for their own purposes, even if the BTO could not support the analysis of territories. A large proportion of participants said that they would continue anyway, and the BTO has agreed to supply them with the necessary maps, at least for one year. Additionally, for one year only, the core plots will be supplemented by a set of about 50 farmland sites, for a special project on Birds of Lowland Farms.

The 2001 breeding season was intended to be the first year of the CBC in its new guise. Foot & Mouth Disease has completely disrupted the fieldwork season, however. At the time of writing, we do not know how many observers were able to visit their plots. Of course, this makes it impossible to assess the success of the new version of the CBC, or how the results of the independently monitored (non-core) plots can be used. It also means that the project on Birds of Lowland Farms has had to be postponed until next year, and last winter's habitat surveys will have to be repeated.

Work to link the BTO/JNCC/RSPB Breeding Bird Survey (BBS) scheme with the CBC will be completed later this year. In future, long-term trends using both BBS and CBC data will be used in the important conservation initiatives, such as alerts, red lists, wild bird indicators and demographic research, that previously relied solely on the CBC.

COVERAGE IN 2000

Sites for the CBC encompass ordinary farms and woods, and some plots of other habitats such as urban parks, wetlands and moorlands, that are chosen, with some guidance from Census Unit staff, by the observers themselves. For each year's survey, around ten visits are needed in the period March-July, during which the observer maps all encounters with birds. Species maps, summarising the activity of each species during the season, show clusters that relate to the locations of breeding territories. Trained Census Unit staff have assessed territory numbers on all

the CBC's species maps, thus ensuring consistent treatment throughout the survey.

The Census continues to receive strong volunteer support. We have received 189 CBC returns for 2000 so far; a few more are perhaps still to arrive. All but a few of these were repeats of 1999 surveys and thus provided data for comparison. A number of maps have yet to be processed, however, so that our estimates of population change will be refined a little further over the coming weeks. Table 1 gives some detail of the plots from which we have drawn data for this report.

The figures in Table 1 are similar to the CBC norm. Half the 130 contributing plots were woodland sites, averaging 19.7 hectares in extent. Farmland, averaging 63.9 hectares, made up most of the rest. Southern England, south of Bristol and London, and Eastern England, between the Thames and the Humber, have always been strongly represented in the CBC, whereas plots in other UK countries are scarce.

SIGNIFICANT CHANGES BETWEEN 1999 AND 2000

The results of the 1999 to 2000 comparison are shown in Table 2 for plots of all habitats, and in Table 3 for a selection of species where sample sizes allow changes to be calculated for farmland and woodland plots separately. We have chosen species that show significant changes on farmland or woodland and those that are of conservation concern. "Significant" indicates that the 95% confidence limits both show the same directional component as the estimate of percentage change — and therefore that we are 95% sure that the increase or decrease is a genuine indication of population change rather than just a chance event.

Fifteen species showed significant population changes across all CBC habitats between 1999 and 2000 (indicated by "*" in Table 2). All except one of these changes being increases, it is clear that 2000, like 1999, was a year of upturn for many UK birds. There were significant increases over the past year for several of our most common and widespread resident birds — Wren, Dunnock, Robin, Blackbird, Song Thrush, Carrion Crow and Chaffinch. This was especially good to note for Song Thrush, a species of high conservation concern. Less-common residents Red-legged Partridge, Tawny Owl and Great Spotted Woodpecker also increased. Among migrant songbird populations, there were increases for Whitethroat, Blackcap and Chiffchaff. The Chiffchaff increase made up for the significant decrease in 1999 (*BTO News* 228: 10-13). The only significant decrease was for Blue Tit but this was of only 6% and runs counter to the long-term increase recorded for this species.

A comparison between farmland and woodland plots (see Table 3) shows that populations of Robin, Song Thrush, Blackcap, Chiffchaff and Chaffinch have increased significantly in both habitats between 1999 and 2000. It was encouraging to see Whitethroat numbers up in both habitats, and significantly so on farmland. Bullfinch populations were slightly up in woodland habitats, but down on farmland; however the decrease on farmland is only a difference of seven territories, and it is still relatively a more abundant species in woodland plots. Interestingly, both increases and decreases tended to be of larger magnitude

TABLE 1. Geographical distribution and habitat composition of plots used in the 1999-2000 comparison.

	Farmland		Woodland		Special		All plots	
Region	No. of plots	%	No. of plots	%	No. of plots	%	No. of plots	%
Southern England	14	26%	23	35%	5	42%	42	32%
Eastern England	18	34%	15	23%	2	17%	35	27%
Western England	9	17%	7	11%	2	17%	18	14%
Northern England	7	13%	11	17%	2	17%	20	15%
Wales	4	8%	2	3%	0		6	5%
Scotland	0		6	9%	1	8%	7	5%
Northern Ireland	1	2%	1	2%	0		2	2%
Totals + % of all plots	**53**	**41%**	**65**	**50%**	**12**	**9%**	**130**	**100%**

TABLE 2. Population changes as measured by the CBC in all habitats, 1999-2000.

Species	% change 1974-99 (25 years)	No. of territories 1999	No. of territories 2000	% change 1999-2000
Little Grebe	+2	11	9	-18 !
Mute Swan	+166	34	37	+9 !
Shelduck	+10	37	38	+3 !
Mallard	+56	295	326	+11
Tufted Duck	+462	33	27	-18 !
Sparrowhawk	+114	28	30	+7
Buzzard	+320	43	43	0
Kestrel	-28	49	50	+2
Red-legged Partridge	-34	37	47	+27 ! *
Grey Partridge	-85	24	26	+8 !
Pheasant	+17	274	278	+1
Moorhen	-22	144	148	+3
Coot	+19	78	74	-5 !
Lapwing	-43	59	64	+8 !
Woodcock	-75	8	9	+13 !
Curlew	-36	22	20	-9 !
Stock Dove	+85	120	132	+10
Wood Pigeon	+96	873	843	-3
Collared Dove	+160	118	117	-1
Turtle Dove	-71	35	31	-11 !
Cuckoo	-31	60	64	+7
Little Owl	-13	16	15	-6 !
Tawny Owl	-15	33	44	+33 *
Green Woodpecker	+57	118	124	+5
Gr. Sp. Woodpecker	+57	126	148	+17 *
Skylark	-55	448	468	+4
Swallow	+39	162	179	+10
House Martin	-30	81	78	-4 !
Tree Pipit	-76	26	32	+23 !
Meadow Pipit	-45	67	55	-18 !
Yellow Wagtail	-36	26	23	-12 !
Grey Wagtail	-21	17	18	+6 !
Pied Wagtail	+2	74	72	-3
Wren	-5	2,903	3,125	+8 *
Dunnock	-44	816	894	+10 *
Robin	+28	2,334	2,631	+13 *
Redstart	+114	47	41	-13 !
Blackbird	-23	1,691	1,787	+6 *
Song Thrush	-55	415	484	+17 *
Mistle Thrush	-40	99	130	+31 *
Sedge Warbler	+13	203	252	+24 !
Reed Warbler	+117	331	349	+5 !
Lesser Whitethroat	-17	60	67	+12
Whitethroat	+40	435	520	+20 *
Garden Warbler	+57	203	190	-6
Blackcap	+120	773	880	+14 *
Chiffchaff	+69	462	576	+25 *
Willow Warbler	-31	907	858	-5
Goldcrest	-56	213	243	+14
Spotted Flycatcher	-76	29	39	+34 !
Long-tailed Tit	0	222	242	+9
Marsh Tit	-53	69	66	-4
Coal Tit	-9	227	256	+13

TABLE 2. Continued.

Species	% change 1974-99 (25 years)	No. of territories 1999	No. of territories 2000	% change 1999-2000
Blue Tit	+9	1,623	1,531	-6 *
Great Tit	+29	1,088	1,144	+5
Nuthatch	+99	115	114	-1
Treecreeper	-26	127	129	+2
Jay	-14	110	116	+5
Magpie	+72	311	299	-4
Jackdaw	+89	222	228	+3
Carrion Crow	+61	350	394	+13 *
Starling	-67	172	162	-6
House Sparrow	-46	131	135	+3
Chaffinch	+24	1,880	2,018	+7 *
Greenfinch	+7	300	311	+4
Goldfinch	-14	165	161	-2
Linnet	-56	222	225	+1
Bullfinch	-58	122	133	+9
Yellowhammer	-55	327	335	+2
Reed Bunting	-61	156	164	+5

Key to Tables 2 and 3

* significant at the 5% level or above.
! small sample size (between 10 and 30 plots).
Species in **bold** are *Birds of Conservation Concern* red-listed or within Tables 1-3 on the list of *Birds of Conservation Importance* (high conservation concern).
Species in *italics* are *Birds of Conservation Concern* amber-listed or within Table 4 on the list of *Birds of Conservation Importance* (medium conservation concern).
The following species now found on fewer than 10 CBC plots annually are excluded from Table 2: Redshank, Snipe, Lesser Spotted Woodpecker, Willow Tit, Grasshopper Warbler, Wood Warbler, Tree Sparrow, Lesser Redpoll and Corn Bunting.

TABLE 3. A comparison of population changes of selected species in farmland and woodland habitats as measured by the CBC.

	Farmland Plots			Woodland Plots		
Species	No. of territories 1999	No. of territories 2000	% change (1999-2000)	No. of territories 1999	No. of territories 2000	% change (1999-2000)
Stock Dove	58	57	-2 !	57	70	+23 !
Cuckoo	30	30	0 !	23	23	0 !
Green Woodpecker	38	44	+16 !	70	70	0
Wren	1,123	1,273	+13 *	1,592	1,640	+3
Robin	803	957	+19 *	1,377	1,505	+9 *
Song Thrush	121	141	+17 *	261	311	+19 *
Mistle Thrush	32	55	+72 *	59	69	+17
Whitethroat	292	367	+26 *	92	97	+5 !
Blackcap	243	288	+19 *	467	526	+13 *
Chiffchaff	121	181	+50 *	308	344	+12 *
Blue Tit	584	528	-10 *	935	900	-4
Starling	111	101	-9 !	44	46	+5 !
Chaffinch	962	1,043	+8 *	814	870	+7 *
Bullfinch	31	24	-23 !	84	97	+15
Yellowhammer	267	288	+8	41	35	-15 !

on farmland than in woodland overall, suggesting that farmland was acting as a secondary habitat for most of these species.

LONG-TERM TRENDS AND ALERTS

Despite the encouraging increases shown by a range of species between 1999 and 2000, it is the trend over a longer period of time that indicates how well UK bird populations are performing. The BTO has established a system for alerting Government to downward trends, based on rates of decline in species over certain time periods. BTO Alerts are either Medium (25-50% decrease) or High (greater than 50% decrease), and are calculated over 25-, 10- and 5-year periods. Table 2 includes the overall trend of the past 25 years, as used to issue the most recent set of Alerts to JNCC (May 2000). Comparison of the long-term trend with the 1999-2000 figure shows whether the latest annual change continues or runs against the trend, but the 25-year trend will be influenced rather little by the 1999-2000 change, however large. All of the Alerts reported here will be tested for significance with the full set of CBC sites once all are analysed.

Nineteen species have shown population decreases of more than 50% during the 25 years 1974-99, and thus have triggered High Alerts. These include all 10 of the widespread species that are priorities in the UK Government's Biodiversity Action Plan. Most alarmingly, six of these species declined by more than 50% just in the 10-year period 1989-99: Grey Partridge, Spotted Flycatcher, Tree Pipit, Willow Tit, Lesser Spotted Woodpecker and Lesser Redpoll. Of the remaining 13 species triggering High Alerts for the 25-year period, seven also triggered Medium Alerts for the 10-year period (Woodcock, Turtle Dove, Marsh Tit, Starling, Tree Sparrow, Yellowhammer and Corn Bunting). Five species exhibited declines in the period 1994-99, triggering 5-year Medium Alerts: these were Grey Partridge, Lesser Spotted Woodpecker, Willow Tit, Starling and Corn Bunting. Lesser Redpoll declined by more than half in just the 5-year period and was the only High Alert in this timespan. Some of these species are now so rare that CBC was unable to estimate the change from 1999 to 2000.

Of the BAP species showing long-term declines, most triggered shorter-term alerts as well but the trends for Song Thrush, Skylark, Bullfinch, Linnet and Reed Bunting were more favourable over the 5- and 10-year periods.

A further 13 species triggered Medium Alerts for the 25-year period: these were Red-legged Partridge, Kestrel, Lapwing, Curlew, Cuckoo, House Martin, Meadow Pipit, Yellow Wagtail, Mistle Thrush, Willow Warbler, Dunnock, Treecreeper and House Sparrow. Of these, Yellow Wagtail also gave a Medium Alert for the 10-year period, 1989-99. Wide confidence

CUCKOO DECLINE IS MATCHED BY SOME OF ITS FOSTER PARENTS

The Cuckoo's song is a widely recognised and popular sound of spring, with an appeal more widespread than just to keen birdwatchers. The general perception of "fewer Cuckoos calling these days" is endorsed by recent CBC findings. The large and overlapping territories of the male bird make monitoring difficult but CBC does provide some meaningful data. Some increase was recorded during the 1960s and 1970s, but since then there has been a decline of around 31% (Table 2). Similar losses have been seen among most of its main foster species in dry habitats, notably Tree Pipit (-76%), Meadow Pipit (-45%) and Dunnock (-44%). Other species parasitised by Cuckoos have increased, however, Reed Warbler by 117% and Robins (now seldom parasitised) by 28%. The number of cuckolded Reed Warbler nests reported to the Nest Record Scheme has also more than doubled, perhaps reflecting increased exploitation of this wetland host. It is possible that the population size of the Cuckoo is influenced by those of its hosts but, given its evolutionary capacity to switch to new hosts. The Cuckoo's decline may owe more to loss of feeding opportunities in UK farms and woods, or in its African winter quarters.

intervals are associated with the indices for House Martin and Yellow Wagtail, however, and some of these Medium Alerts may not be statistically significant when all of the 2000 results are included. Little Owl, Blackbird and Whitethroat triggered Medium Alerts but only when the period was extended to cover 1968-99. 1968 was the year before the famous 'Whitethroat crash', from which the species has not fully recovered.

The following 15 species, which have all undergone declines sufficient to trigger High or Medium Alerts since 1974, were not included as *Birds of Conservation Concern* in the listings prepared in 1996: Red-legged Partridge (not eligible, as an introduction), Lapwing, Cuckoo, Lesser Spotted Woodpecker, House Martin, Tree Pipit, Meadow Pipit, Yellow Wagtail, Mistle Thrush, Willow Warbler, Goldcrest, Treecreeper, House Sparrow, Lesser Redpoll and Yellowhammer. Although the distribution of some species, like Tree Pipit and Lesser Redpoll, is believed to lie mostly beyond the CBC's area of main coverage, the sheer magnitude of the declines detected on CBC plots warrants urgent concern.

CHANGES IN ALERT STATUS SINCE 1999

One species, House Sparrow, has been demoted from High Alert to Medium Alert, its 25-year population change having ameliorated slightly from -51% in 1973-98 to -46%. This does not represent any real change in its population status, however. The CBC trends suggest that the House Sparrow decline may be levelling out in recent years, but do not include urban habitats, where evidence from other sources suggest that this species is declining rapidly.

Four other species — Blackbird, Tree Sparrow, Lesser Whitethroat and Willow Warbler — improved marginally in alert status due to improvements in their 25-year, 10-year or 5-year population changes.

The only new High Alert issued is for Bullfinch, whose 1968-99 population change is -52% (up from -49.8% for 1968-98). Treecreeper now triggers a Medium 25-year Alert on the basis of a decline of 26% (previously 24.7%). Two species, Marsh Tit and Yellow Wagtail, trigger new Medium 10-year Alerts, and Corn Bunting a Medium 5-year Alert.

MANY THANKS

The CBC's key contribution to bird conservation in the UK has been made possible by the efforts of over 2000 volunteers over the past four decades. We would like to extend our warmest thanks to the great many observers who have participated in the CBC over the years, and especially to current surveyors for continuing to support the scheme.

The statistics presented earlier indicate that

SEDENTARY DOVES ARE CURRENTLY THE MORE SUCCESSFUL

CBC has monitored four of the UK's five common doves and pigeons. Feral Pigeons, while not monitored reliably, are clearly thriving. The 25-year trends for the others range from +160% for Collared Dove to -71% for Turtle Dove. Wood Pigeon (+96%) and Stock Dove (+85%) are both success stories. Wood Pigeon declines in the 1960s and early 1970s were attributed in part to cold winters, chemical seed dressings, weed control and the switch to autumn-sowing of cereals. This species adapted by breeding earlier and exploiting the new abundance of oil-seed rape. Stock Doves have apparently shown a protracted recovery from the pesticide kills of the 1950s and early 1960s. Collared Doves have become largely sedentary in the UK following the influxes that followed the first colonisation in 1955. It seems likely that the migratory habit of the Turtle Dove is a major factor influencing its decline. Tied to a rigid annual cycle of migration, breeding and moult, it may have been unable to change its timing of breeding or its feeding strategies to exploit the new opportunities on farmland that have been available to the resident species. Although its use of habitat and breeding performance are currently being researched, habitat change has also been occurring in its African winter quarters, and the hunting pressure the Turtle Dove encounters on migration has hardly diminished.

plots are surveyed, on average, for more than six years! Among current surveys, 45 began in the 1970s. This reflects the tremendous commitment and hard work put in by observers. Most impressive, several have been surveying since the 1960s.

In particular we would like to acknowledge the special contribution made by some of our longest-serving observers: Rebecca Woodell (1968), Eric Ward (1968), Lyall Charlton (1967), Geoff Atkin (1965), John Butterworth (1964), Bill Edwards (1964), Mary Waller (1964), Richard Williamson (1963), Denis Summers-Smith (1962) and finally P D Mann, who has censused his plot at Bucklebury Slade in Berkshire since 1961: the year 2000 was his 40th census year! A very big thank you to all of you!

The CBC has been supported by the JNCC.

Bird Populations 6:100-104
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BTO News 236:8-10

WATERWAYS BIRD SURVEYS — LATEST RESULTS, AND A NEW CHALLENGE

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Renewed funding has given us the opportunity to increase the Waterways Breeding Bird Survey sample during 2002-3. Are BTO volunteers up to the challenge? *John Marchant* reports the results of Waterways Bird Survey and WBBS in 1999 and 2000 and looks to the future of surveying breeding birds along waterways.

MUESTREOS EN CURSOS ACUATICOS – ULTIMOS RESULTADOS Y UN NUEVO RETO

La renovación del financiamiento nos ha brindado la oportunidad de aumentar la muestra del Muestreo de Aves en Cursos Acuáticos en 2002-3. Aceptarán el reto los voluntarios de BTO? *John Marchant* informa sobre los resultados del Muestreo de Aves en Cursos Acuáticos y el WWBS en 1999 y 2000 y analiza el futuro del muestreo de aves reproductoras en los cursos de agua.

WATERWAYS BIRD SURVEYS – DERNIERS RESULTATS ET NOUVEAU DEFI

Le renouvellement du financement nous donne l'opportunité d'augmenter l'échantillon pour la Waterways Breeding Bird Survey durant 2002-03. Est-ce que les bénévoles du BTO sont prêts pour ce défi? *John Marchant* expose les résultats du Waterways Bird Survey et du WBBS en 1999 et 2000, et envisage l'avenir des recensements d'oiseaux nicheurs le long des cours d'eau.

FLIEßGEWÄSSER-BRUTVOGELBESTANDSMONITORING – JÜNGSTE ERGEBNISSE UND EINE NEUE HERAUSFORDERUNG

Aufgestockte Finanzmittel geben uns die Möglichkeit, das Flächennetz im Fließgewässer-Monitoring in den Jahren 2002-03 auszuweiten. Werden sich die Mitarbeiter dieser Herausforderung stellen? *John Marchant* fasst die Ergebnisse des WBS und WBBS für 1999 und 2000 zusammen und beleuchtet die Zukunft von Bestandserfassungen an Fließgewässern.

Observers for the Waterways Bird Survey (WBS) began mapping breeding birds along linear waters (rivers and canals) in 1974. Back then, special monitoring of the riparian habitat was recognised as necessary because of its important numbers of breeding birds, including specialists rarely present in other habitats. This habitat was also under constant threat from water-borne pollution or from insensitive management that could, relatively quickly, severely reduce populations of waterside birds such as Dipper and Kingfisher in a whole water catchment.

These threats are still present today, although the risk of catastrophe has reduced, largely through the role of the Environment Agency and the Scottish Environmental Protection Agency as conservation-minded managers and pollution watchdogs.

The BTO/JNCC/RSPB Breeding Bird Survey (BBS) has now taken over from the Common

Birds Census (CBC) the role of monitoring bird populations in the wider countryside but it is already clear that BBS cannot provide a full replacement for WBS's data for waterbirds. This is because, although some BBS routes cross rivers at bridges, few follow them, and so birds like Common Sandpiper and Grey Wagtail that live close to the water are unlikely to be recorded. BTO has a commitment to provide ongoing annual indices for certain waterside birds to feed into overall assessments of avian trends. There is a continuing role, therefore, for targeted annual surveys of breeding birds along waterways, alongside the more general role of the BBS.

The Waterways Breeding Bird Survey (WBBS) was piloted in 1998 to see whether BBS methods could be successfully adapted for surveying transects alongside rivers and canals. A small test sample of 200 sites were selected randomly, and these were augmented by a further series of canal plots chosen specifically to investigate the effects of a fishing close season on the numbers of breeding birds. The field method used was very like BBS, with two transect walks during the season, but with a single transect route alongside the chosen waterway. Transect sections were each 500 metres, to match the Environment Agency's River Habitat Survey protocol, not 200 metres as in BBS, and observers were allowed to select from one to ten contiguous sections, depending on access. In contrast to WBS, in which only wetland bird species are recorded, WBBS is like BBS in covering all species of birds and (optionally) of mammals too.

PROGRESS WITH WBBS

Further funding for WBBS allowed us to proceed to a second phase in 1999-2000, in which BTO volunteers continued their surveys on random stretches and direct comparisons of WBS and WBBS results were begun, by asking WBS observers to contribute to both schemes.

The first three seasons of WBBS, 1998-2000, have established that covering a random selection of linear waterways is a viable proposition for the BTO. The adaptations made to the BBS method work well, and volunteers have proved willing to survey the random sites. Problems have been reported with access permissions, and with finding a safe route that can be followed, not only early in the season, but also in June after the vegetation has grown, perhaps to more than head height! Some sites present special challenges, perhaps having a lot of water noise that hides those made by birds or, because they are in ravines for example, with no visibility beyond 25m. Many observers have it easy, with a clear, level waterside path, a good view of surrounding land, and more birds than would be enjoyed in almost any other habitat. Whatever the situation, the reaction of observers has almost always been positive. At my own site, encounters with Stone-curlew and Woodlark, and once a Long-eared Owl, have made the walks especially exciting!

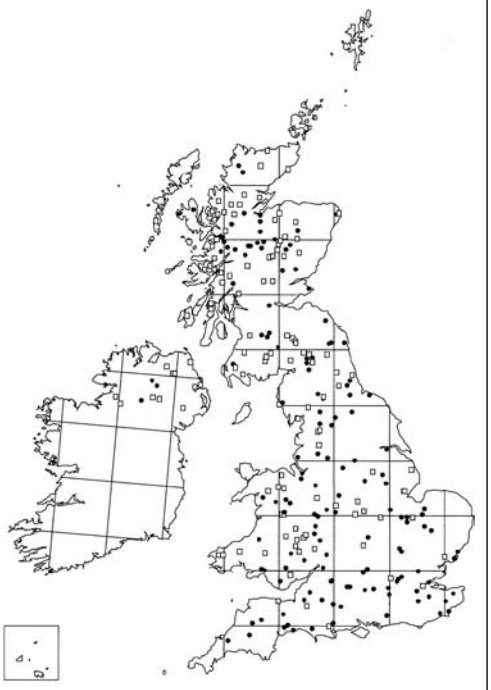
Table 1 summarises the scheme's development so far. A notable feature is the way WBS observers have risen to the challenge since 1999, while the canal sites that were chosen in the study of fishing seasons in 1998 have been dropped. The 263 sites that have so far been randomly selected for coverage, and the 144 of these that have been surveyed at least once in 1998-2000 are mapped in Figure 1. The map shows that plots have been selected in all regions and that WBBS volunteers have come forward in all parts of the UK.

POPULATION CHANGES FROM WBS FOR 1999-2000

We now have a number of options for estimating population changes for waterbirds,

TABLE 1. Totals of WBBS stretches surveyed in 1998-2000.

Reason for survey	1998	1999	2000	Surveyed at least once
Random stretches	107	115	104	144
For comparison with WBS data	15	63	60	70
Other non-random stretches	46	4	5	4
TOTAL	**168**	**182**	**169**	**261**



Random WBBS squares selected for coverage in 1996-2000: those surveyed at least once are shown as black dots and those not yet surveyed as open squares.

FIGURE 1. WBBS squares selected for coverage in 1998-2000.

including the WBBS results that are randomised and therefore representative of the UK. As the established scheme, however, and with its large sample of high-quality mapping surveys, WBS is still vitally important.

Results from WBS on population changes of waterways birds have been reported annually since the 1970s, most recently in *BTO News* 231: 12-13, covering the period to 1999. For the years 1999-2000, Table 2 summarises the contributing surveys. Each one of these 85 represents a well-conducted WBS mapping survey in both years, for which we are very grateful. WBS plots have always had a strong representation of slow rivers in the south and east of England but, compared with CBC, there is better support in the north and west; a map was included in the previous WBS report.

Drawing data from these 85 WBS plots, each of which was surveyed in a comparable way in both years, enables us to calculate percentage changes between 1999 and 2000 for 22 species (Table 3).

Table 3 shows the numbers of sites and territories from which the percentage changes were estimated. Where the sample sizes are small, or changes very variable from plot to plot, there may be a wide confidence interval around the percentage change, indicating uncertainty, and we cannot be sure that there was a real change in population. For two species, Canada Goose and Grey Wagtail, population changes between 1999 and 2000 were statistically significant. For the goose, another large increase compounds the population growth that has been measurable by WBS since 1980 (see *BTO News* 222: 14). Grey Wagtail has been in significant long-term decline, so that its increase in 2000 leaves it well short of its population level in the mid-1970s.

Setting other results into their longer-term context, Whitethroat and Sand Martin have continued their upward trends since the lows of the early 1970s. Lapwings have apparently increased in the WBS sample long-term, although the confidence interval for this estimate is

TABLE 2. Plots contributing to the estimates of population change 1999-2000.

	Fast-flowing rivers	Slow-flowing rivers	Canals	Other or mixed types	Totals
Southern England	3	9	2	0	14 (16%)
Eastern England	0	10	8	1	19 (23%)
Western England	4	6	8	1	19 (23%)
Northern England	6	6	8	1	21 (25%)
Wales	1	3	0	0	4 (5%)
Scotland	4	2	1	1	8 (10%)
Totals	**18 (21%)**	**36 (42%)**	**27 (32%)**	**4 (5%)**	**85**

TABLE 3. Population change as measured by the WBS, 1999-2000, and summary figure for 1975-99 .

Species	23-year trend 1975-2000	1999 territories	2000 territories	% change	Number of plots
Little Grebe	-57 *	18	17	-6	10 !
Mute Swan	+76 *	110	105	-5	52
Greylag Goose	–	64	58	-9	11 !
Canada Goose	–	192	244	+27 *	36
Mallard	+190 *	2022	1944	-4	84
Tufted Duck	+41	100	82	-18	26
Goosander	–	60	58	-3	25 !
Moorhen	-10	711	746	+5	74
Coot	+61 *	405	405	0	43
Oystercatcher	+110 *	115	113	-2	22 !
Lapwing	+165	93	104	+12	37
Curlew	+72 *	48	46	-4	17 !
Common Sandpiper	-18 *	85	83	-2	17 !
Kingfisher	-8	44	49	+11	39
Sand Martin	+54	767	1014	+32	19 !
Dipper	-14	77	83	+8	27
Grey Wagtail	-42 *	123	142	+15 *	51
Pied Wagtail	-48 *	138	142	+3	54
Sedge Warbler	-13	397	439	+11	50
Reed Warbler	+79 *	283	286	+1	27
Whitethroat	+69	243	263	+8	58
Reed Bunting	-68 *	202	190	-6	52

* change statistically significant at the 5% level
! small sample size in 1999-2000 (between 10 and 25 plots)
Species in *italics* are Amber-listed in *Birds of Conservation Concern*; Reed Bunting is Red-listed.

exceptionally wide; the trends for the last 10 and five years, which are more reliable, are both downward (see http://www.bto.org/birdtrends). The species is undergoing rapid decline in the CBC farmland sample and is retracting from westerly parts of its former breeding range. An increase in 2000 is thus against the recent trend. Reed Bunting, already subject to high conservation concern because of its severe and apparently accelerating decline, reversed the small gain it made in 1999.

Missing from this year's table are Redshank and Yellow Wagtail which, after their worrying long-term declines in the WBS habitat, were each present on only eight plots.

WBBS MONITORING RESULTS TO DATE

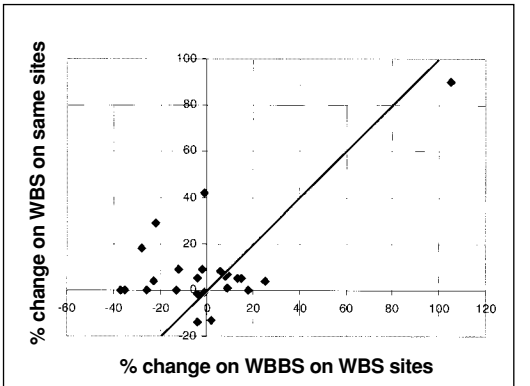
An important question for the future of waterways bird surveys is how the results compare between the long-running WBS and the new WBBS. This is analogous to the comparison of CBC with BBS but with the extra benefit that, thanks to many WBS observers, we also have a direct comparison of results at the same sites. If we find similar estimates of population trend, we will be encouraged to continue towards WBBS as the BTO's main method of monitoring common waterside species. Also, if WBBS results for other species match those from BBS, they may be able to boost the existing BBS sample.

We are also investigating the value of WBBS as a predictor of bird populations when linked to the River Habitat Survey. WBBS is already becoming established with the Environment Agency as the standard method of bird survey in this habitat.

Parallel series of population change results from WBS and WBBS have been prepared and tabulated in an interim report to the Environment Agency. It is really still too early to say what the results are showing, however, and the data collected over the next few seasons will be crucial. Trend data from WBBS cover only three

seasons so far, and have wide confidence intervals because WBBS sample sizes have not yet grown towards those that would be needed for a full ongoing survey. We know from BBS that results from transect surveys will be more variable than will those from mapping.

Matched WBBS and WBS data from the same plots span only two years but these are the data we would expect to show the closest similarities. Plotting these percentage changes for 1999-2000 (Figure 2) suggests that results from the WBBS transect method found more negative trends between years than the WBS method and that, as yet, we have not achieved significant agreement between the results from the two survey methods (the diagonal line in Figure 2). For Sand Martin, which showed the largest change on these plots, estimates were very similar between the two methods, and for Mallard, the most abundant WBS species, they were identical. Given more years, and a larger annual sample for WBBS, we would expect these differences to shrink. This is what we will be investigating over the next few seasons.



Comparison of 1999-2000 percentage changes between WBS mapping and WBBS transects carried out on the same plots. Each point represents one of 24 species covered by the mapping survey.

FIGURE 2. Comparison of 1999-2000 WBS and WBBS.

NEXT STEPS FOR WBBS

Clear results from WBBS will require a substantial increase in surveys over the next two breeding seasons, 2002-03. *A new challenge to the BTO's network of Regional Representatives and survey volunteers is therefore to double the coverage of random stretches to over 200 by 2003.* We hope this can be achieved without affecting the levels of coverage for either WBS or BBS, which will need to continue at full strength, and despite the start of this new phase of WBBS having been delayed from 2001 by Foot & Mouth Disease. This new level of annual coverage would make WBBS viable as a long-term monitoring scheme (although its operation beyond 2003 will require further funding).

We hope that as many observers as possible will continue to survey their existing sites, whether as WBS observers contributing WBBS data too or as part of the random sample. New observers will also be needed. Open squares in Figure 1 represent the existing opportunities for extra observers to become involved. There are many stretches in Scotland, Wales, Northern Ireland, and in much of the Midlands and north of England, where sites selected in 1998 have not yet found an observer. These will remain the top priorities for new coverage in 2002-03.

Early this winter, we plan to inform Regional Representatives of a further set of additional new sites selected for coverage next season. These will fall in all parts of the UK, so that there will be opportunities everywhere for new observers to join the scheme. Potential new observers should make themselves known, either to their RR or to me, during this autumn and winter, so that they can be matched to the sites available.

Please help WBBS to realise its full potential.

MANY THANKS

The Census Unit is very grateful to the many observers who contribute survey data from waterways, using either survey method. Your efforts are much appreciated.

The development of WBBS is supported by the Environment Agency and by Essex & Suffolk, Anglian, Northumbrian, and Severn Trent Water Companies.

Bird Populations 6:105-106
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BTO News 237:12-14

HERONRIES CENSUS — RESULTS FROM 2000

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John Marchant reports on the current status of the Grey Heron in the UK and on the Heronries Census, now in its 74th season.

CENSO DE COLONIAS DE GARZAS – RESULTADOS DE 2000
John Marchant informa sobre el estado actual de la garza real en el Reino Unido y en el Censo de Colonias de Garzas, ahora en su temporada número 74.

RECENSEMENTS DE HERONS – RESULTATS DE 2000
John Marchant décrit le statut actuel du Héron cendré au Royaume-Uni et les recensements de hérons, maintenant dans leur 74eme saison.

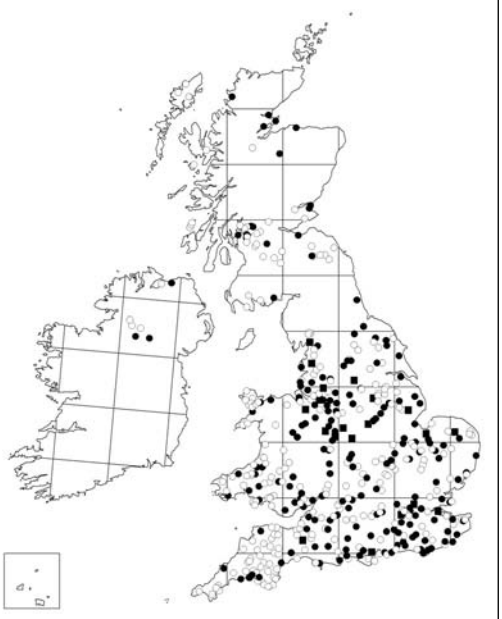
GRAUREIHER-KOLONIEERFASSUNG – ERGEBNISSE AUS DER BRUTSAISON 2000
John Marchant berichtet über den derzeitigen Status des Graureihers in UK und die Ergebnisse aus der 74. Brutsaison in der Graureiher-Bestandserfassung.

The Heronries Census involves fewer observers than other long-running BTO surveys but the results it produces document the population changes of its target species with high precision, and over a longer period than for any other breeding bird survey in the world.

The survey operates through the BTO's Regional Representatives, or other regional organisers, who ensure that, through their local network of volunteers, as many as possible of the active heronries in each UK region are visited each breeding season and a count made of the active nests. Counts are then returned to Thetford where, thanks to a recent grant from NERC, we have built a database of counts and information about the colony site that houses all the information we hold and can be easily interrogated for a variety of purposes. Periodically, the BTO has augmented the ongoing annual series of counts with a full national survey. The most recent of these was in 1985 and another is now due.

The data returned for 2000 cover 7,250 nests in 477 colonies. Although a little lower than the 1999 totals, these figures continue the welcome growth in participation in the Heronries Census since 1991, when the number of colonies counted had fallen to 301. More nests are counted now than in any previous year, except 1985 when 7,528 were counted in a full UK survey: this reflects both the population growth of the Grey Heron in England & Wales, estimated at 26% during 1988-98, and the higher proportion of UK colonies that are now counted annually.

We are hoping that the scope of the Census can widen still further in the next few years, and we have a number of possible developments in mind. Regular counting of more colonies will help to clarify trends both nationally and regionally. Little Egrets, now nesting in a number of southern heronries, add a new and unexpected dimension to the Heronries Census, and many observers supply nests counts for the Cormorants that are also invading many heronries. The map of sites for 2000 identifies



Heronries counted for the Heronries Census in 2000: open circles 1-10 nests, closed circles 11-50 nests, closed, blue squares more than 50 nests.

Heronries counted in 2000.

the parts of the country in which more support is particularly needed, but we would urge anyone who knows of a heronry to check that it is counted for the BTO census by sending details to the Regional Representative or to me at The Nunnery.

Where heronries were counted in both 1999 and 2000, their results can be used to assess population change between two seasons (see Table).

The picture is essentially one of little change and of numbers remaining high, except that in Scotland, where the sites monitored are few and perhaps unrepresentative, there was an increase that reversed last year's 9% drop. The current high level of the Grey Heron population shows that the birds have been able to cope well with recent winters, and also reflects habitat creation and the active protection of many key sites. A paper describing the national trend in Heron numbers and its calculation has been submitted for publication.

ACKNOWLEDGEMENTS

Many thanks are due to the Heronries Census counters, organisers and others who support the scheme. I would like to record a special acknowledgement to the late David Andrews of the Strangford Lough Wildlife Scheme who provided many counts from Northern Ireland during 1988-99 and whose influence is sadly missing from this report.

Heronries counted in both 1999 and 2000

Species	No. of sites	1999 total	2000 total	% change 1999-2000
England	316	5,597	5,550	-1
Wales	59	624	606	-3
Scotland	40	358	396	+11
Northern Ireland	2	59	55	(-7)

Bird Populations 6:107-113
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BTO News 235:13

THE BREEDING BIRD SURVEY: 1994-2000

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Mike Raven and *David Noble* report on the results of the BTO/JNCC/RSPB Breeding Bird Survey for 2000 and look at regional differences in population trends.

EL MUESTREO DE AVES REPRODUCTORAS: 1994-2000
Mike Raven y *David Noble* informan sobre los resultados del Muestreo de Aves Reproductoras del BTO/JNCC/RSPB en el 2000 y examinan las diferencias regionales en tendencias poblacionales.

LE BREEDING BIRD SURVEY: 1994-2000
Mike Raven et *David Noble* exposent les résultats du recensement de la BTO/JNCC/RSPB pour 2000, et examine les variations régionales de l'évolution des populations.

DAS BRUTBESTANDSMONITORING BBS: 1994-2000
Mike Raven und *David Noble* beschreiben die Ergebnisse des gemeinsamen Brutbestands-Monitoringprogramms von BTO, JNCC und RSPB des Jahres 2000 und beleuchten regionale Unterschiede in den Bestandstrends.

The BTO/JNCC/RSPB Breeding Bird Survey (BBS) continues to be highly successful in monitoring populations of our common breeding birds. Overall, a positive picture emerged for the breeding season in 2000 with 12 species showing significant increases for the first time.

The BBS is a volunteer-based survey of birds run by the BTO since 1994. Randomly selected squares are allocated to participants within each BBS region by volunteer Regional Organisers (ROs), and recording forms are forwarded through these ROs to BTO headquarters for analysis. The BBS is a line transect survey, where birds are recorded on two visits per season. Volunteers are asked to record the birds they see whilst walking up to 10 x 200 m transect sections. Its sampling and field protocols were designed to increase the level of coverage and eliminate the geographical and habitat biases of the long-running Common Birds Census (CBC). The 2000 breeding season was the seventh and final year in which both surveys were run in parallel, and henceforth BBS will be the principal terrestrial survey for monitoring population trends of common and widespread breeding bird species in the UK.

SURVEY COVERAGE

During the past year, we have received 2,248 sets of forms for the 2000 BBS counts, a little down on the 2,379 received for 1999, but nevertheless an impressive total. The majority of coverage came from England (1,696 squares)

with smaller numbers from Scotland (244), Wales (216) and Northern Ireland (82). Many parts of the country have reached a near optimum level of coverage, with attention now being directed towards areas with relatively few squares surveyed.

SPECIES COVERAGE

A total of 215 species was recorded in 2000, two less than the 1999 total, and with no UK rarities being recorded, apart from a rather late Red-breasted Goose. Although the overall number of squares being covered had fallen in 2000, the number of species breaking the "present in 100 squares" mark remained at 89, in addition to which a further 13 were recorded in over 50 squares. Among the 113 species that were recorded in less than 50 squares across the country, were scarce or very localised breeders, passage migrants and late winter visitors. These include Black-necked Grebe, Little Egret, White-tailed Eagle, Montagu's Harrier, Corncrake, Dotterel, Green Sandpiper, Redwing, Fieldfare, Marsh Warbler, Chough and Scottish Crossbill.

POPULATION TRENDS

Table 1 shows the population changes between the last two seasons analysed (1999-2000) and for the full survey period to date (1994-2000). As in previous years, trends are estimated using a log-linear regression model that corrects for differences in coverage among regions. With another year's worth of data added to the BBS dataset, more and more meaningful medium-term population trends start to appear. The following highlights some of the more interesting results that came out of the analyses for the past seven years.

UNITED KINGDOM

Across the UK, 45 species increased and 18 species declined significantly between 1994 and 2000. Over this period, Swift and Spotted Flycatcher were the only species to show new significant declines for the UK as a whole. Numbers of Swifts fell from a peak in 1999, and Spotted Flycatcher have continued their long-term decline. This negative news is outweighed by the 12 species that showed significant increases for the first time. Of particular interest is the 25% increase in Tree Sparrow, a species which has declined dramatically over the past 25 years but now seems to be stabilising, although at a much lower level, possibly even increasing in some parts of the country. Raven also produced ever more positive results with an impressive 64% increase over the past seven years. On a negative note, 16 species continued to show a decline in numbers, with the Willow Tit heading the pack of "species in trouble" with a 54% decline.

Several farmland birds, whose declines have been well documented, continued their downward trend. These include Grey Partridge, Lapwing, Turtle Dove, Skylark, Yellowhammer and Corn Bunting. In contrast to this, several of the "small-bodied" residents, such as Goldcrest and Stonechat, continued to increase. Both species are very vulnerable to harsh winter weather, and the recent spate of relatively mild winters has probably helped to augment numbers.

ENGLAND

Almost 1,700 squares were covered in England in 2000, the results of which showed that 35 species had increased significantly and 23 declined between 1994 and 2000. For many, the population trends in England closely follow those of the UK. A number of species however, went against the overall trend with Meadow Pipit, Jay, Starling, Linnet, Redpoll and Reed Bunting showing significant declines in England, against UK populations that appear to be stable. For species such as Meadow Pipit and Redpoll, this reflects the favourable status of the higher density populations in their northern or upland strongholds.

ENGLISH REGIONS

In the past two years the BBS has been able to report on population trends from within the nine Regional Development Agency (RDA) Regions. This analysis has shown some interesting regional differences within England. Sparrowhawk, for example, generally showed a small decline across most parts of England, apart from in the East Midlands, where an increase of over 100% was recorded (statistically

Table 1. Population changes of common and widespread species 1999-2000 and 1994-2000.

Species	Sample	Change 99-00	Change 94-00	lcl	ucl
Great Crested Grebe	55	28.7	29.6	-3	73
Cormorant	140	37.9	30.6 *	9	57
Grey Heron	462	1.7	17.8 *	5	32
Mute Swan	167	5.3	19.5 *	1	41
Greylag Goose	82	-2.9	68.9 *	25	129
Canada Goose	289	28.0	51.1 *	31	74
Shelduck	114	-15.9	-46.7 *	-56	-35
Mallard	914	1.6	24.7 *	17	33
Tufted Duck	122	46.4	82.8 *	50	123
Sparrowhawk	264	0	-2.1	-17	15
Buzzard	448	11.0	40.8 *	27	57
Kestrel	509	4.4	-29.4 *	-37	-21
Red Grouse	102	-14.2	15.2	-6	42
Red-legged Partridge	371	10.4	26.9 *	13	42
Grey Partridge	220	41.8	-22.3 *	-34	-8
Pheasant	1223	36.9 *	40.5 *	33	49
Moorhen	498	0.8	18.0 *	7	30
Coot	188	9.9	55.0 *	34	80
Oystercatcher	231	8.2	-8.1	-17	2
Golden Plover	78	12.8	-11.9	-32	14
Lapwing	534	8.8	-12.8 *	-20	-5
Snipe	116	14.4	34.6 *	9	65
Curlew	431	2.4	-12.8 *	-19	-6
Redshank	67	50.0	8.0	-15	37
Common Sandpiper	63	39.4	-0.7	-22	27
Black-headed Gull	430	31.2 *	-20.3 *	-29	-11
Common Gull	124	-1.8	8.3	-10	30
Lesser Black-backed Gull	414	-6.3	34.0 *	18	52
Herring Gull	453	5.0	5.8	-5	18
Great Black-backed Gull	85	24.7	1.5	-19	27
Feral Pigeon	532	-5.5	2.8	-7	13
Stock Dove	582	0.9	8.7	-2	20
Wood Pigeon	1812	3.0	3.4	-1	7
Collared Dove	977	-0.8	18.0 *	11	25
Turtle Dove	192	-7.3	-23.5 *	-36	-9
Cuckoo	749	12.5	-19.4 *	-26	-12
Little Owl	89	11.3	8.0	-17	41
Tawny Owl	77	-16.4	-8.2	-31	22
Swift	848	-22.6 *	-18.1 *	-25	-11
Green Woodpecker	538	6.1	22.0 *	10	35
Gr Sp Woodpecker	576	9.2	54.9 *	40	71
Skylark	1382	10.8 *	-7.9 *	-11	-4
Sand Martin	96	17.8	38.9 *	9	77
Swallow	1407	9.0	20.7 *	15	27
House Martin	721	1.5	33.9 *	23	46
Tree Pipit	124	-7.4	12.0	-8	36
Meadow Pipit	620	10.6	4.0	-1	10
Yellow Wagtail	157	31.9	-4.7	-19	13
Grey Wagtail	148	0	41.4 *	15	74
Pied Wagtail	951	3.3	25.1 *	16	34
Wren	1764	6.0	23.6 *	20	28
Dunnock	1467	1.9	7.8 *	3	13
Robin	1703	9.1 *	19.7 *	16	24

Table 1. Continued.

Species	Sample	Change 99-00	Change 94-00	lcl	ucl
Redstart	132	6.6	44.7 *	21	73
Whinchat	80	-12.2	-21.0	-39	2
Stonechat	74	13.8	114.7 *	58	192
Wheatear	236	-11.3	-6.3	-18	7
Blackbird	1787	1.8	13.3 *	10	16
Song Thrush	1371	5.7	12.1 *	6	18
Mistle Thrush	939	2.1	-2.5	-10	6
Grasshopper Warbler	59	-7.9	4.6	-28	52
Sedge Warbler	241	40.9 *	55.4 *	37	76
Reed Warbler	85	0	13.8	-7	40
Lesser Whitethroat	202	19.4	-19.8 *	-32	-5
Whitethroat	969	20 *	26.0 *	18	34
Garden Warbler	373	-16.7	-5.0	-16	8
Blackcap	1026	0.7	49.4 *	41	59
Wood Warbler	58	5.6	-43.2 *	-58	-24
Chiffchaff	918	10.6	4.5	-2	12
Willow Warbler	1224	-1.7	12.9 *	8	18
Goldcrest	522	16.9	87.0 *	72	104
Spotted Flycatcher	199	-8.1	-21.3 *	-34	-6
Pied Flycatcher	43	-5.6	-15.6	-38	15
Long-tailed Tit	625	3.4	21.5 *	9	35
Marsh Tit	119	23.9	45.4 *	16	83
Willow Tit	59	-20.7	-53.9 *	-67	-35
Coal Tit	528	1.9	7.3	-2	17
Blue Tit	1666	-2.8	2.8	-1	7
Great Tit	1520	4.4	17.6 *	12	23
Nuthatch	282	1.8	13.6	-1	31
Treecreeper	264	-20.6	11.6	-5	31
Jay	499	6.9	-6.6	-16	4
Magpie	1388	3.8	9.4 *	5	15
Jackdaw	1166	-0.9	17.5 *	11	25
Rook	999	-3.6	5.6	-3	15
Carrion Crow	1698	2.6	17.1 *	12	23
Raven	160	47.8	63.8 *	34	101
Starling	1461	-1.0	-5.5	-11	0
House Sparrow	1221	3.3	-5.3 *	-9	-1
Tree Sparrow	134	15.7	25.4 *	2	54
Chaffinch	1791	2.9	6.5 *	3	10
Greenfinch	1280	12.6 *	33.9 *	27	41
Goldfinch	1011	11.0	11.1 *	3	20
Siskin	113	17.8	19.2	-5	49
Linnet	1008	10.6	-6.4	-13	1
Lesser Redpoll	118	40.3	8.2	-14	36
Bullfinch	438	7.1	-25.0 *	-34	-15
Yellowhammer	1003	2.3	-11.7 *	-16	-7
Reed Bunting	329	-5.0	-3.5	-14	8
Corn Bunting	146	-22.6	-35.4 *	-46	-23

Key to Table 1

Population changes of widespread species 1999-2000 and 1994-2000. The sample size indicated is the mean number of squares occupied each year over the seven years (excluding squares where the species was recorded in only one year). The figures presented are the percentage changes in population levels for the respective time periods, those marked with an asterisk were significantly different at a 5% level. For the 1994-2000 period, the lower and upper 95% confidence intervals (ucl, lcl) are given. Species in **bold** are red-listed, and species in *italics* amber-listed in *Birds of Conservation Concern*.

significant but from a small sample). Over the past 30 years the Sparrowhawk has both increased greatly in numbers and spread eastwards, with the counties of the East Midlands being the last to be re-colonised.

Stock Dove also provided an example of contrasting regional trends, with a large increase (171%) reported from the North West, compared to a decline of 37% in East Anglia. Yorkshire also appeared to be a favourable area for some species — Kestrel and Lapwing recording respective increases of 54% and 45%, but declining in most other parts of England. As is frequently the case, some of the trend variation within England can be explained by east-west or north-south gradients in climate, topography and habitat. The pattern of increases in the north and declines in the south for species such as Willow Warbler can be attributed to their range contraction northward, possibly as a result of climate change. The Swallow, in common with a number of farmland species, has fared worse in the East, which may be related to regional differences in agricultural land use, the West becoming increasingly dominated by livestock farming and the East increasingly used for arable crops.

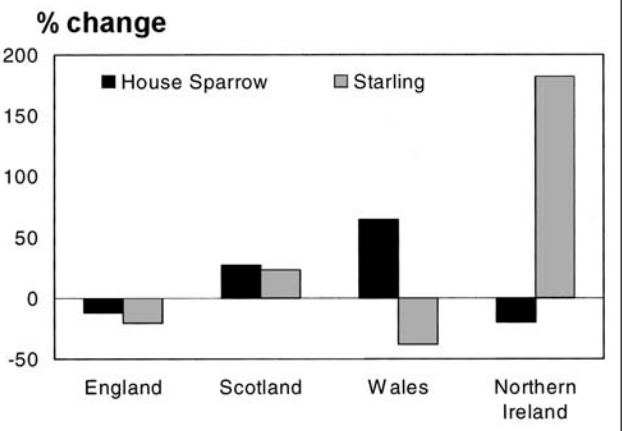
SCOTLAND

Overall, only six species showed a significant decline in Scotland during the 1994-2000 period. This was more than counterbalanced by the 18 species that increased, 34 species showing no clear trend. Some of the north-south differences in trends observed in England, were reflected in the Scottish results. The significant increases for Willow Warbler and House Sparrow are in contrast to their overall declines in England and, for Cuckoo, Scotland was the only region in the UK with a positive trend. Only one species, Wood Pigeon, was found to be declining in Scotland whilst increasing in England. Of greater concern are the BBS trends for several of the wader species in Scotland. Lapwing and Curlew both experienced significant declines, whilst Oystercatcher, Golden Plover, Redshank and Common Sandpiper numbers appeared to be at best, stable. Scotland is an extremely important breeding area for all of these species, holding a considerable proportion of the UK population. Data from the BBS are currently being compared to other sources of information on Scottish waders.

BOX 1. TRENDS FOR TWO URBAN BIRDS IN THE FOUR COUNTRIES OF THE UK

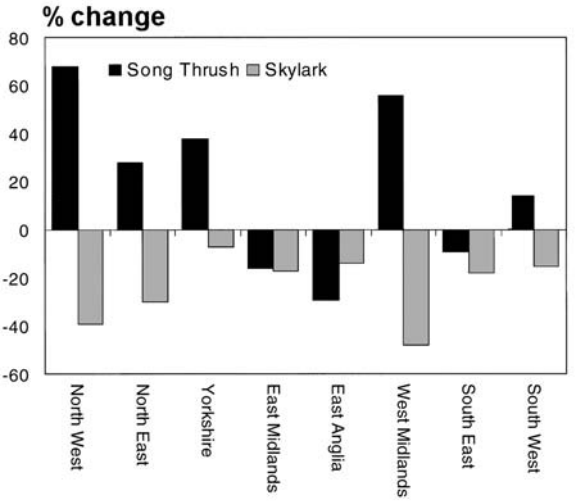
The chart shows the percentage change in index value for House Sparrow and Starling between the years of 1994 and 2000. It clearly shows the different trends within each constituent country of the UK. The House Sparrow has declined in England and Northern Ireland while increasing in Scotland and Wales. For Starlings, declines in England and Wales contrast with increases in Scotland and Northern Ireland.

Reasons for declines in these two largely urban species have not yet been established and the BTO is currently carrying out extensive analyses of census, ringing and nest record data in attempts to determine the causes.



BOX 2. REGIONAL TRENDS FOR TWO RED-LISTED UK SPECIES

The Song Thrush and Skylark were red-listed in the UK's *Birds of Conservation Concern* list in 1996 because of their severe long-term declines. The chart shows the percentage change in index value for Song Thrush and Skylark between 1994 and 2000 for eight of the nine Government regions within England. The London region has not been shown due to small sample sizes. The Song Thrush is faring well in the north and west of the country while decreasing in the south and east. The explanation for this pattern may be related to increases in summer droughts that make it difficult for this species to find sufficient food. The Skylark, on the other hand, is decreasing throughout England, its decline linked to changes in agricultural practices such as autumn-sown cereals and loss of winter food sources. During the period monitored by the BBS, the largest declines in England appear to be in predominantly upland regions.



WALES

The BBS results in Wales were generally positive with 19 species showing a significant increase and only four species in decline. Several small-bodied residents and woodland species, including Goldcrest, Robin, Blackbird, Song Thrush and Treecreeper, continued to prosper. There were no new declines, although Starling and Yellowhammer continued their downward trend. A few species outperformed their neighbours in England, with Meadow Pipit and Linnet increasing against a backdrop of decline to the east. Conversely, Mallard and Chaffinch both continued to decline in Wales while increasing in England.

NORTHERN IRELAND

The relatively small number of squares covered in this region limited the number of species for which significant trends could be found. Although the situation looks positive, with 14 species showing a significant increase and none in decline, this partly reflects the preponderance of very abundant species in the list. Species showing significant increase included Swallow, House Martin, Starling, Robin, Blue Tit and Greenfinch. In contrast to the UK trend, Skylark numbers also increased, albeit in a rather small sample. House Sparrow and Mistle Thrush were the only species to show any hint of decline, although populations of both had apparently improved since 1999.

THE FUTURE

Firstly, we are extremely grateful to all the Regional Organisers, observers and members alike who took part in the survey last season. The BBS continues to be an enormous success, and is now the major source of information on national and regional trends in common birds. It is used by government and non-government conservation organisations to identify priorities for research and as a basis for conservation initiatives which aim to improve the status of

declining species. BBS also allows us to track the growing numbers of species, such as Buzzard, which are currently re-colonising areas lost over the past 150 years, and introduced species such as Greylag and Canada Geese which have spread across wetland urban areas. BBS methods have been successfully adapted abroad, most recently in France, where it is hoped that successful coverage in a number of pilot regions will raise the profile and encourage uptake at a national level. The start of "BBS schemes" in Poland and Hungary have also been successful, despite the problems with fewer potential volunteer birdwatchers and fewer sources of funding. These initiatives are paving the way for better integration of national bird monitoring schemes across Europe, which may eventually deliver valuable information on European population trends.

The 2001 season has obviously been an extremely difficult one, with much of the survey work cancelled due to access restrictions imposed by Foot and Mouth Disease. We do, nevertheless, intend to produce results for the season, albeit restricted to areas or habitats that were less affected. Keeping our fingers crossed against continued outbreaks, we need to put this year behind us and look forward to spring 2002 and a chance to see what has happened on our BBS squares. In 2002, it is vital that we quickly get back to the level of coverage attained during 1999 and 2000 and work towards achieving our target of 2,500 squares.

Many thanks to Richard Bashford, whose long and enthusiastic association with the BBS has helped to make it the success it is today. Richard has now joined the RSPB and has passed the reins over to Mike Raven, previously the BTO's Nest Records Officer. Lastly, thanks again to all the BBS observers and Regional Organisers for their hard work over the past seven years.

Bird Populations 6:114-116
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BTO News 236:11

LINKING THE BREEDING BIRD SURVEY TO THE COMMON BIRDS CENSUS: A PROGRESS REPORT

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The BTO's *David Noble* and *Steve Freeman* look at how CBC and BBS data can be linked to provide continuity of monitoring.

COMBINACION DEL MUESTREO DE AVES REPRODUCTORAS CON EL CENSO DE AVES COMUNES: INFORME DE PROGRESO
David Noble y *Steve Freeman* del BTO examinan cómo los datos del CBC y el BBS pueden ser combinados para asegurar la continuidad del monitoreo.

RELIER LE BREEDING BIRD SURVEY AU COMMON BIRD CENSUS: UN RAPPORT D'ETAPE
David Noble et *Steve Freeman* du BTO's intéressent à la façon dont les données du CBC et du BBS peuvent être reliées pour assurer un monitoring continu.

ZUSAMMENHANG ZWISCHEN DEN BRUTBESTANDSMONITORING PROGRAMMEN BBS UND CBC: NEUE ERGEBNISSE
David Noble und *Steve Freeman* vom BTO untersuchen die Frage, wie die Ergebnisse der CBC- und BBS-Programme verknüpft werden können, um eine bessere Kontinuität beim Brutbestandsmonitoring zu gewährleisten.

PHASING OUT THE CBC

The Common Birds Census (CBC) is the longest running survey of terrestrial breeding birds in the world, and the results underpin a number of important conservation initiatives in the UK. However, although the CBC has provided valuable long-term data on population trends, because of its bias in coverage towards the south and east of England, and because its plots are selected by the observers rather than at random, it has certain limitations for monitoring national bird populations. It also requires considerable effort on the part of volunteers and BTO staff, and hence the number of plots has tended to remain about 200. For these reasons, the Breeding Bird Survey (BBS), based on randomly selected sites across the entire UK, was introduced in 1994 and has been growing ever since. The official CBC scheme finished in March 2001, and the period of overlap is the seven years between 1994 and 2000. Work to develop a method of linking the two schemes started in 2000 and is continuing.

PRELIMINARY RESULTS:

BBS AND CBC SHOW SIMILAR PATTERNS IN MAIN CBC AREA

The first stage of this work is now complete.

The annual indices derived from the BBS were compared with those from the CBC over the period 1994 to 1999. The geographical bias of the CBC was addressed by restricting this comparison to CBC plots and BBS squares within the main area covered by the CBC in lowland southeast Britain. Within each scheme, sites obviously differ in bird abundance, and hence trends were determined from a model that controls for the differences between sites as well as looking for differences between years. For CBC, counts refer to the estimate of the number of territories within the plot. For BBS squares, the maximum total count of all birds of each species, over all distance categories, was used to estimate annual indices.

The most important result is that both surveys showed very similar annual patterns for the vast majority of species such as Whitethroat (Figure 1). This was also true for species such as Tufted Duck, for which neither survey is ideally suited. In fact, formal testing revealed a significant difference in trends for only five of the 75 common species tested. These were Wren, Blackbird, Robin, Chiffchaff & Pheasant. In the case of the first three species, the extremely large amounts of data mean that even slight differences show up as statistically significant. As the closely parallel peaks and troughs in the figure for Wren (Figure 2) show, these small differences between the surveys are unlikely to be biologically important. Variation between the BBS and CBC trends for Pheasant and Chiffchaff, however, may reflect real differences in trends in different habitats or in how the birds are counted.

Although these results support the idea that CBC and BBS surveys track changes in bird populations in the same way, the lack of a significant difference for some species, particularly the scarcer ones, must be interpreted with caution. An example is Yellow Wagtail (Figure 3). Both trends increased between 1994 and 1996, but whereas the CBC trend remained stable from 1996 to 1999, the BBS trend crashed by almost 50% over the same period. This species is increasingly rare and the wide confidence intervals surrounding the trends makes it difficult to detect a significant effect. This problem was also evident in the

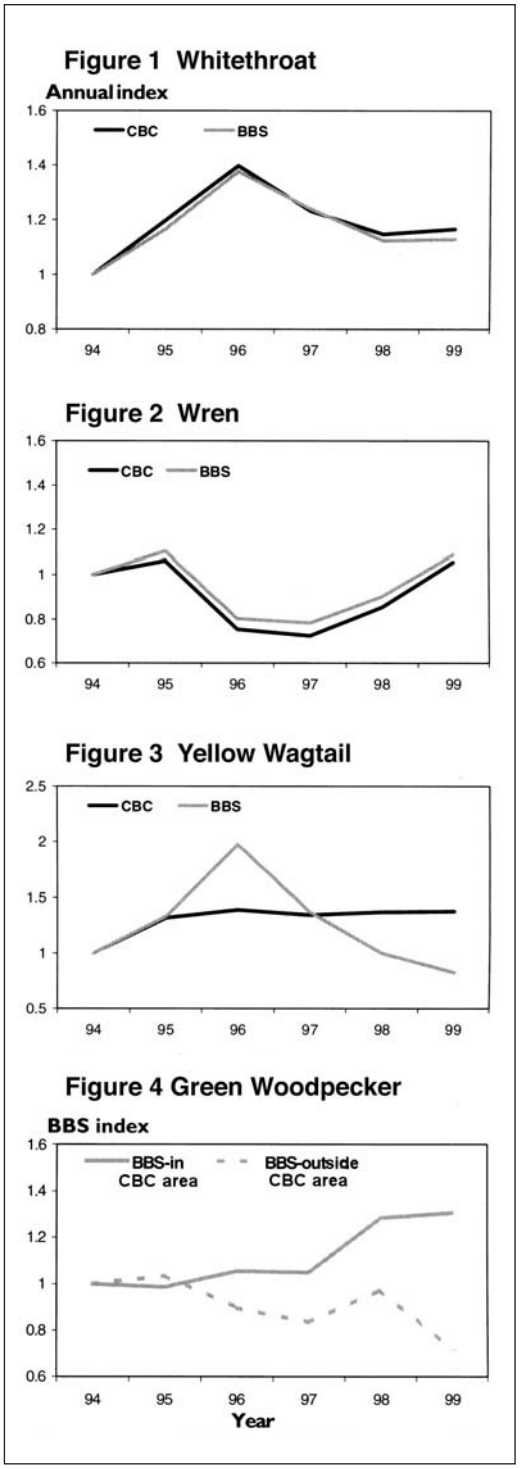

FIGURE 1-4. Comparisons of CBC and BBS results for selected species.

plots of a few other species that are poorly monitored by either survey due to factors, such as the nocturnal Tawny Owl or colonial House Martin.

The other important conclusion from this work is that it confirms that population trends based on the geographically-biased CBC may not reflect the situation across the entire UK. Of the 75 species, 30 (40%) species showed a significantly different pattern of BBS indices within the CBC area, compared to those outside this area (i.e. the Southwest, Wales, Northern Ireland, Scotland and the northernmost parts of England). Figure 4 shows the trends for Green Woodpecker, one species which appears to be increasing in the main CBC area but declining in the peripheral parts of its range. Although differences in regional BBS trends have been previously reported in the BBS annual reports, this is the first formal test of the effect of the geographic coverage of the CBC on estimated population trends. Although we cannot assume that historical population trends would have shown the same geographical patterns as the ones tested here (between 1994 and 1999), it does suggest that regional effects are important for a large number of species.

NEXT STEPS

Given that we have historical CBC data for most species, which in many cases probably differ from populations covered by the BBS, and we have more comprehensive BBS data for the period since 1994, how do we link these trends? This work demonstrates that the two schemes tend to yield the same patterns for widespread terrestrial species within the same area. It is therefore possible to calculate long-term trends using a regional subset rather than all of the data, based on CBC data until 1994 and joint CBC and BBS data from then onward. However, for species such as the Lesser Redpoll, we know that CBC trends are not indicative of the bulk of the UK population in the north, and hence the national BBS data, where available, are more appropriate. All of these combinations tell us something slightly different about the status of the species and the best way of presenting long-term trends in populations will depend on context. The challenge is to report population change figures in a simple but meaningful way. To that end, the BTO plans to discuss these results and recommendations with other conservation organisations early this autumn. Thanks to all BBS and CBC observers who have helped to generate this impressive run of data.

Bird Populations 6:117-121
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BTO News 233:10-11

WILLOW WARBLERS IN LONG-TERM DECLINE

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Dawn Balmer, Steve Freeman and *Chris Wernham* of the BTO's Demography Unit report on population and productivity changes on Constant Effort Sites 1999-2000.

EL MOSQUITERO MUSICAL EN DECLIVE DE LARGO PLAZO
Dawn Balmer, Steve Freeman y *Chris Wernham* de la Unidad de Demografía del BTO informan sobre cambios poblacionales y de productividad en los Sitios de Esfuerzo Constante 1999-2000.

UN DECLIN A LONG-TERME POUR LE POUILLOT FITIS
Daum Balmer, Steve Freeman et *Chris Wernham*, de l'unité de démographie du BTO, décrivent les changements de population et de productivité sur les Constant Effort Sites en 1999-2000.

FITIS MIT KONTINUIERLICHER BESTANDSABNAHME
Dawn Balmer, Steve Freeman und *Chris Wernham* von der BTO Demography Unit berichten über Änderungen in Bestand und Produktivität auf Dauerfangflächen (CES) von 1999-2000.

The popular and highly successful Constant Effort Sites (CES) Scheme completed its 20th year of operation in 2000.

Running a CES site involves ringing in a standardised way, erecting mist-nets in the same positions and for the same length of time during twelve visits spread between early May and late August each year. Being a CES ringer requires dedication and an aptitude for very early mornings — 4am is the norm rather than the exception!

Because of the standardised approach, we are able to use data from catches to monitor changes in the abundance and productivity of common breeding songbirds. Changes in the total number of adults caught enable us to measure changes in population size, while changes in the ratios of young birds to adults are used to monitor changes in breeding success. We also use retraps of adult birds ringed in previous years to estimate annual survival rates. Over this past winter, we have completely updated and automated the process of producing results from CES data, so that we are now easily able to calculate long-term trends in numbers of adults and breeding success. We encourage CES ringers to send in their data promptly each year in electronic form. This allows us to produce timely results, identify any worrying changes in abundance and breeding success, and highlight these to other conservation bodies. We have also produced some up-to-date trend graphs for the Wider Countryside Report on the BTO web site (www.bto.org). In this article we have included information on long-term trends in the "new look" table of results (Table 1).

TABLE 1. Changes in captures on CES sites from 1999 to 2000

	Adults		Juveniles		Adult Abundance		Productivity (juvs per adult)	
Species	n 2000	Total	n 2000	Total	% Change	Long-term trend	% Change	Long-term trend
Wren	101	779	98	1716	-2	⇒	-5	⇑
Dunnock	102	652	99	1025	-6	⇒	-1	⇒
Robin	99	576	98	1839	+1	⇑	-6	⇓
Blackbird	103	983	91	717	+1	⇓	-3	⇒
Song Thrush	84	317	72	200	+3	⇓	-20	⇒
Sedge Warbler	71	1194	69	1655	+11 *	⇒	+10	⇒
Reed Warbler	61	2272	59	2225	+18 *	⇓	-15 *	⇑
Lesser Whitethroat	31	95	47	199	+11	⇓	+48	⇒
Whitethroat	58	377	65	618	+21 *	⇒	-1	⇒
Garden Warbler	59	336	62	327	-14 *	⇒	+3	⇓
Blackcap	90	895	95	1880	-16 *	⇑	+23 *	⇒
Chiffchaff	72	313	84	1196	+12	⇑	+7	⇒
Willow Warbler	89	1342	90	1843	-16 *	⇓	+15 *	⇓
Long-tailed Tit	86	534	86	1209	+23 *	⇒	-8	⇒
Willow Tit	13	20	19	63	-32	⇒	+7	⇒
Blue Tit	95	597	97	1979	-7	⇒	+47 *	⇓
Great Tit	92	464	96	1146	-1	⇒	+14	⇒
Treecreeper	42	77	64	178	-18	⇒	-7	⇒
Chaffinch	78	578	59	343	+10	⇒	-22 *	⇑
Greenfinch	38	211	25	135	-4	⇑	+19	⇒
Goldfinch	37	109	23	56	-13	⇒	-10	⇒
Linnet	14	52	14	34	-46 *	⇓	+11	⇒
Bullfinch	82	460	59	313	-9	⇓	-23 *	⇒
Reed Bunting	65	342	39	210	-5	⇓	-12	⇒

n 2000 = number of sites operated in 2000 at which the species was captured
Total = total number of individuals captured on sites (for adults and juveniles separately) during 2000
% change = percentage change in numbers of birds caught between 1999 and 2000
* = significant change at the 5% level
Long-term trend = long-term trend during the period of CES ringing. See *Wider Countryside Report* on the BTO web site for further details
⇑ = long-term trend shows an increase
⇓ = long-term trend shows a decline
⇒ = long-term trend shows stability

NEW HIGH IN 1999

The number of sites operated in 1999 reached a new high of 138. We are on target to achieve a similarly high number for 2000. This is a tremendous achievement by all concerned. Fourteen sites were operated for the first time in 2000, including new sites in Scotland and Ireland.

Ringers have made superb progress computerising their data in recent years. In 2000, over 90% of the CES data were received in an electronic format.

The data we present here come from 121 CES sites: 99 from England, 14 from Scotland, 5 from Ireland and 3 from Wales. The habitats covered are similar to previous years, with the majority of sites located in reedbed, wet scrub or dry scrub and a smaller number of sites in deciduous woodland.

LONG-TAILED TITS UP

For most parts, the 1999/2000 winter was relatively mild, which probably helped many of

our resident species to survive through to the following breeding season. During the early part of the CES season, ringers had to contend with flooded sites, with some net rides inaccessible for a week or more. Nest recorders and survey workers reported good numbers of resident species, such as Wren, Robin and Chaffinch. Long-tailed Tit was the only resident to show a statistically significant increase in numbers on CES sites (Table 1), with an increase of 23% in the catches of adult birds between 1999 and 2000 (see Box 1 for further information). There were also statistically significant increases in the numbers of adult Sedge Warblers, Reed Warblers and Whitethroats caught between 1999 and 2000. This may suggest more favourable conditions in their wintering grounds. Interestingly, all three species winter in a similar geographical area (West Africa) and Reed Warblers and Sedge Warblers tend to occupy freshwater habitats such as reedbeds, papyrus stands and the marshy fringes of lakes, whereas Whitethroats prefer dry scrubby habitats. Long-term trends in the abundance of adult Sedge Warblers and Whitethroats suggest a fairly stable population. Reed Warblers show a long-term decline in adult abundance, so the increase seen this year may just be a short-term blip.

Garden Warblers, Blackcaps and Willow Warblers showed statistically significant declines in adult numbers between 1999 and 2000, perhaps suggesting less favourable conditions on the wintering grounds. There is some evidence to suggest that many Blackcaps from Britain and Ireland winter in the Mediterranean basin and North Africa, with smaller numbers reaching West Africa. Information from ringing recoveries suggests that both Garden Warblers and Willow Warblers winter mainly around the Ivory Coast and Ghana and occupy wooded habitats. Perhaps there could have been slight differences in the environmental conditions between the part of West Africa where Sedge Warblers, Reed Warblers and Whitethroats spend the winter, and the more southerly part of West Africa that might account for the differences in over-winter survival? It is possible that those species using more wooded habitats are not affected by drought to the same extent as those species wintering in the freshwater habitats. In the long-term, the Blackcap population has increased whereas the Garden Warbler population has remained approximately stable. Linnet was the only species with a resident population to show a statistically significant decrease in numbers between 1999 and 2000, a continuation of the long-term decline of this species on Constant Effort Sites. Regular readers will note that Redpoll has been omitted from the list of species regularly reported on by CES ringing. The number of sites catching Redpolls dropped to an all time low in 2000, so that we can no longer confidently report on the fortunes of this species. We have added Willow Tit to the list of species, as numbers of sites monitoring this species are acceptable.

MIXED BREEDING SUCCESS

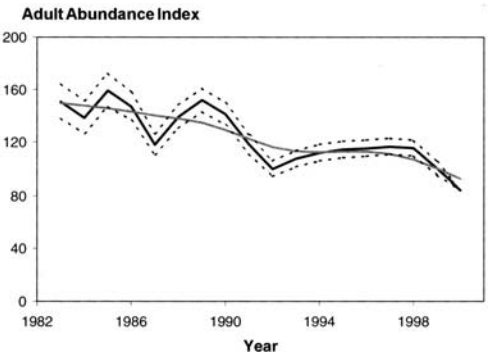
Early breeders seemed able to take advantage of the favourable conditions during a largely dry, settled and sunny March 2000. For the third successive April, inclement weather upset early nesting attempts. Localised heavy downpours led to difficult conditions for some species. The weather picked up in late April and early May, only to return to unsettled weather in mid May. CES ringers and nest recorders reported huge losses as a result of the wet weather. The effect on nestbox species appears to have been particularly localised.

Overall, breeding success in 2000 was mixed (Table 1). Despite heavy losses in some areas, Blue Tits had a successful breeding season overall, and this was one of only three species to show a statistically significant increase; the two others were Blackcap and Willow Warbler. In the long-term, Blue Tits are showing a decline in productivity, coupled with a stable breeding population. Willow Warbler productivity is also declining in the long-term, despite an increase in 2000.

Following a successful breeding season in 1999, Reed Warblers showed a statistically significant decline in productivity in 2000. It is possible that early clutches were lost during the poor weather but that sunnier, warmer weather in late July may have helped them to rear late broods. Two finches, Chaffinch (small increase in adult numbers and small decrease in juvenile numbers) and Bullfinch (small decline in adults but large decline in juveniles) also showed

BOX 1. LONG-TERM TRENDS UP AND DOWN

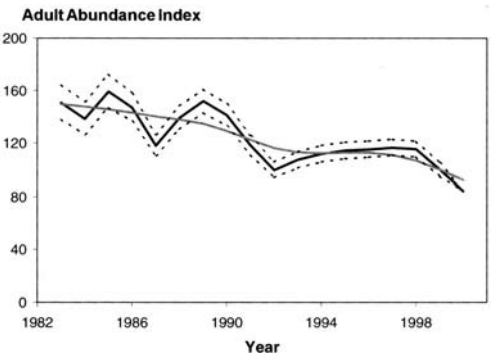
Here we present the long-term trends in adult numbers for Willow Warblers and Long-tailed Tits. Long-term trends are far more important in conservation terms than annual fluctuations, which may be linked to particular short-term weather events.



Catches of adult Willow Warblers have shown a long-term decline (32%) during the period of CES ringing. Note that the Index is set to 100 in 1999. The graph shows that between 1983 and 1989 the Index fluctuated but showed no clear trend. It then fell sharply from 1989 to 1992 and has shown little recovery since. The population decline during this period was well documented by the Common Birds Census, and further analyses using information from CES sites revealed that the decline was probably caused by a large reduction in the survival rates of adult birds. This suggests that factors away from the breeding grounds may have caused most of the change in breeding numbers. Interestingly, the survival rates of Willow Warblers ringed in northern Britain did not change whereas the adult survival rates of southern birds declined from 45% during 1987-1988 to 24% during 1991-1992. The reason for the decline in survival rates is unclear but habitat loss or deterioration on the wintering grounds might be a possible reason. Also it is possible that Willow Warblers from the north and south of Britain winter in slightly different regions of Africa and have therefore been subjected to different environmental changes (Peach et al 1995). Following this sharp decline, the Willow Warbler population remained fairly stable until 1998, then declined again.

Using information from CES and the Nest Record Scheme we issued an alert to JNCC in March 2000, highlighting high conservation concern for Willow Warbler. Information from Nest Record Cards has shown a significant increase in nest failure rates at the nestling stage. It would be extremely interesting to look again, in detail, at the population changes of Willow Warblers, given that we now have a longer run of data on survival rates and information on productivity from CES ringing.

Catches of adult Long-tailed Tits have shown a long-term increase (31%) during the period of CES ringing. Note that the Index is set to 100 in 1999. The population index for Long-tailed Tit has shown many annual fluctuations over time, despite the general upward direction. The severe weather of February 1991 probably accounts for the reduced catch of adult Long-tailed Tits in that year but the weather does not appear to affect this species as much as it does for other resident species, such as Wren, Robin and Dunnock (see *BTO News* 227). The productivity of Long-tailed Tits has remained relatively stable, which might suggest that the increase in adult numbers is more likely to be due to increased survival. The recent mild winters have no doubt helped Long-tailed Tits to survive in higher numbers. Information from Garden BirdWatch shows that there is a regular influx of Long-tailed Tits into gardens during late winter when food is particularly scarce in the wider countryside.



statistically significant declines in breeding success in 2000. Chaffinch nests seem particularly prone to becoming saturated during heavy downpours, which may lead to losses during such weather conditions.

New Constant Effort Sites are still required. If you are interested in joining the scheme please contact Dawn Balmer at BTO for further information. Sites must be run by specially trained and licenced ringers, although help from non-ringers is much appreciated. If you like the sound of CES ringing, why not consider becoming a trainee ringer? Contact the Ringing Office at BTO HQ for details.

REFERENCES

Peach, W.J., Crick, H.Q.P. & Marchant, J.H. 1995. The demography of the decline in the British Willow Warbler population. Journal of Applied Statistics 22: 905-918.

THANK YOU

As with all ongoing BTO projects, the success of the CES Scheme depends entirely on the dedication, enthusiasm and skill of its volunteers. We are grateful to all ringers who participated in the scheme in 2000. Special mention must be made to the four sites that completed 20 years of operation in 2000; Llangorse Lake run by Jerry Lewis and Llangorse RG, Treswell Wood run by Treswell Wood IPM Group, Kimpton Mill run by Tom Kittle and Marsworth Reservoir run by Stuart Downhill and Aylesbury Vale RG. This is an incredible achievement — congratulations and thank you.

Whilst space prevents us from acknowledging all CES ringers, we would like to thank the following ringers and groups for their continued support: Basildon RG, Chew Valley RS, R C Cole, Gibraltar Point BO, J A Glazebrook, R J Graham, A Hilton, Itchen RG, A J Johnston, A Kerr, R J Lanaway, A J Langstaff, A W Lauder, Merseyside RG, Nunnery RG, M E O'Donnell, R Proctor, C M Reynolds, L F Roberts, D Robertson, S T Robinson, M H Rogers, K P Royles, Severn Vale RG, SW Lancs RG, SW Notts RG, R Smith, Stour RG, W G Taylor, D J Turner, R J Wakeling, C Walton, Wicken Fen RG, W Wilts RG. (BO= Bird Observatory, RG= Ringing Group, RS= Ringing Station).

The Constant Effort Sites Scheme was undertaken within the Partnership between the BTO and JNCC as part of its programme of research into nature conservation.

Bird Populations 6:122-124
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BTO News 228:5

EARLY BREEDING BITTERNS AND BARN OWLS

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BTO Research Biologist, *David Glue*, describes how favourable weather during the 1999/2000 winter, followed by "spring-like" warmth early in New Year 2000, stimulated a host of premature nesting operations among the UK's birds.

FECHAS TEMPRANAS DE ANIDACION EN AVETOROS Y LECHUZAS

David Glue, biólogo investigador del BTO describe cómo las condiciones favorables durante el invierno de 1999-2000, seguidas de temperaturas primaverales a inicios del 2000, estimularon la anidación temprana en las aves del Reino Unido.

DES BUTORS ET DES CHOUETTES EFFRAIES QUI NICHENT PRECOCEMENT

Le biologiste chercheur du BTO, *David Glue*, décrit comment les conditions météorologiques favorables de l'hiver 1999/2000, suivies de la douceur printanière du début de l'année 2000, ont stimulé des comportements prématurés de nichage chez les oiseaux du Royaume-Uni.

FRÜH BRÜTENDE ROHRDOMMELN UND SCHLEIEREULEN

BTO-Wissenschaftler *David Glue* beschreibt, wie günstige Witterungsbedingungen im Winter 1999/2000, gefolgt von frühlingshafter Wärme zu Jahresanfang 2000 eine ganze Reihe frühzeitiger Brutaktivitäten bei britischen Vögeln auslösten.

Yet again, 1999 illustrated how climate warming is not necessarily a sound recipe for good nesting success. Despite UK mean monthly temperatures well above average, or marginally so (as in June and December 1999), many species experienced only a mediocre, or relatively poor year, in terms of young reared (*BTO News* 225: 20, 227: 10-12).

Range expansions, further to those shown in *The New Atlas of Breeding Birds in Britain and Ireland 1988-1991*, included Goosander and Siskin (southern counties), Buzzard and Red Kite (East Anglia), Woodlark and Black Redstart (Midlands), Raven and Nuthatch (SW Scotland), Osprey and Mandarin (Central Region), Pochard and Pintail (Outer Isles). Stonechats and Grey Wagtails re-occupied former haunts or spilled over into sub-optimal habitats. Concern intensifies for depleted populations of Capercaillie, Black Grouse and Twite nationwide, and for Kestrel, Tawny Owl and Meadow Pipit in certain areas.

Several trends continued: tree-top nesting by Merlin and Hen Harrier; Osprey and Peregrine on electricity pylons, and ground nesting by Magpie and Long-eared Owl.

MILLENNIUM WARMTH STIMULATES RAPTORS, TITS AND PARAKEETS

New Year 2000 kicked off in promising fashion,

temperatures topping 10°C in the first week, prompting vigorous song from many species, including Crossbill, Robin, Wren and Song Thrush, eye-catching displays among Golden Eagle, Raven and spotted woodpeckers, and nest-claiming by tits, Nuthatch and Ring-necked Parakeet. Damaging winds, gusting to 80-100 knots either side of the New Year, led to further heavy nest damage of colonial stick-nesting species such as Grey Heron, Cormorant and Rook. Buzzard, Goshawk, Red Kite and Osprey nest platforms were affected to a lesser extent. Frequent mild, frost-free episodes throughout January, led to unexpected reports of clutches started by Grey Herons (Kent), Great Crested Grebes (tidal Thames, Surrey) and Barn Owls (Bristol) by the third week, as well as Mallards, Collared Doves and Feral Pigeons (various localities). Reports of nesting Moorhens (Gloucs), Blackbirds (Chichester, York), Song Thrushes (Milton Keynes and Liverpool) and House Sparrows (Inner London) came from conurbations benefiting from a warmer microclimate, and included shopping malls, cattle and fruit markets, railway terminals, or wildlife sanctuaries. A cold northwesterly episode from the 22nd, when temperatures dipped to -7°C (Surrey) on the 27th, accompanied by freezing fog, retarded events. Although the end of January saw freezing conditions, this did not have a serious impact on impressive, large roosts of Avocets and Little Egrets, a good scatter of over-wintering Greenshank, Ruff, Green and Common Sandpipers, or fewer Common Crane, Spoonbill and Little Stint.

FEBRUARY SUNSHINE AND SHOWERS FAVOURS GREBES, OWLS AND GODWITS

February continued the mild theme to winter overall, with daily temperatures as much as 3°C above average. With some exceptionally warm days (e.g. 16°C at Chelmsford, Essex on the 8th), butterflies (including brimstone and painted lady), bats and hedgehogs were active. With a scarcity of frosts, mists and fogs, and record-breaking sunshine values, vegetation and bird nesting activity was some 2-3 weeks ahead of schedule in many areas by St Valentines Day. Wetland habitats played host to high populations of grebes, wild swans, geese (notably Brent), duck (though Smew were in short supply) and plovers, many the legacy of influxes following record-breaking low temperatures on the nearby Continent in November 1999. Fresh wetland sites were soon occupied by welcome extra pairs of Bittern, Black-tailed Godwit, Water Rail and Dipper. Shelducks, Lapwings, Ringed Plovers and Kingfishers soon displayed nesting intent at established haunts. By the month's end a remarkable spectrum of 19 species with active nests holding eggs or young had been reported to the BTO. Less likely examples were those clutches started by Little Grebe (Hants), Long-eared Owl (Nottingham), Wren (Essex) and Mistle Thrush (Oxon). Broods of Tawny Owl, Woodpigeon and Robin were ready for ringing.

MAD MARCH MIXTURE HELPS RESIDENTS AND MIGRANTS ALIKE

March flattered to deceive. With high pressure becoming established over the UK, most areas were treated to three weeks of sunny, dry weather. This triggered some prompt frenetic display and egg-laying, among grebes, dabbling ducks, Rooks, thrushes, Robins and Dunnocks, by mid month. At this point, the Ravens nesting atop Chester Cathedral were incubating a full clutch of six eggs. Mute Swans (Dorset), Red Kites (Oxon), Kestrels (Hants), Woodcocks (Co Cork) and Magpies (Essex, Merseyside) were among the more unusual examples of species commencing clutches. Long-eared and Short-eared Owls wintered in some strength, including Short-eared in coastal eastern counties of Ireland. These raised hopes of further nesting attempts to bolster the first confirmed cases of breeding in Ulster in 1997, followed by unprecedented numbers in Co Antrim in 1999. Ironically, the official start of spring (21st), witnessed a decline in pressure, bringing a raw easterly wind to most regions, checking to some degree advanced leaf bud burst, insect and soil invertebrate food supplies, that enhanced the ongoing trend towards earlier egg-laying. Temperatures slowly climbed back as March went "out like the proverbial lamb" sparking off a further spate of nest-building amongst resident wildfowl, thrushes and finches, and aiding the passage of pioneer pairs of spring migrants, among which

Chiffchaff and Wheatear were dominant. Osprey (Tayside), Little Ringed Plover (Bucks), Ring Ouzel (Denbigh) and Sand Martin (Dumfries) were holding territory at traditional sites by the final week.

KITES FLY EAST AND DARTFORDS GO WEST IN SPRING STOCK-TAKE

Brambling and Fieldfare, "star" birds of winter 1999/2000, lingered long in some regions and, tantalizingly, sang lustily. At sites in Wales, this falsely fuelled hopes of adding further species to the principality's growing list of breeding birds which had been bolstered in recent years by Hoopoe (1996), Eider (1997) and Dartford Warbler (1998).

The UK's residents and certain early migrants reached April Fool's Day well ahead of schedule, but vulnerable to the vagaries of nature. A brief but severe northerly blast, together with substantial accumulations of snow on 3rd-4th and mid-month, followed by one of the wettest April in some areas since 1818, led to brood losses among Grey Herons, ducks, Rooks and Thrushes. Spring migrants flooded back over a warm May Bank Holiday, as temperatures topped 20°C, with early clutches started by Chiffchaff and Swallow, as the nesting season got into full swing.

Bird Populations 6:125-127
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BTO News 231:19

SEA EAGLES AND MED GULLS LIVEN A LACKLUSTRE BREEDING SEASON

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BTO Research Officer, *David Glue*, describes the nesting fortunes of UK breeding birds in 2000.

AGUILAS Y GAVIOTAS ALEGRAN UNA TEMPORADA SIN BRILLO
David Glue, jefe de investigación del BTO, describe las fortunas nidificantes de las aves reproductoras del Reino Unido en 2000.

LA SAISON DE REPRODUCTION DES PYGARGUES
ET LES MOUETTES MELANOCEPHALES
Le chercheur du BTO, *David Glue*, décrit la réussite du nichage des oiseaux du Royaume-Uni en 2000.

SEEADLER UND SCHWARZKOPFMÖWEN
BELEBEN EINE LANGWEILIGE BRUTSAISON
BTO-Wissenschaftler *David Glue* bespricht den unterschiedlichen Bruterfolg bei den britischen Brutvogelarten im Jahr 2000.

Another mild winter, premature spring warmth with a late cold snap, vacillating summer temperatures, and see-sawing water levels were features yet again detrimental to the UK's breeding birds.

WOODLARKS AND LONG-TAILED TITS PROFIT FROM EARLY SPRING WARMTH

Following a comparatively poor nesting season in 1999, (*BTO News* 225: 20; 227: 10-12) there were high hopes for 2000. Early on, ringers and survey workers reported buoyant populations of resident Wrens, Robins and Chaffinches, as well as encouraging local upturns in Song Thrush, Skylark and Bullfinch numbers. "Spring-like" heat in February, prompted a spate of egg-laying among grebes, dabbling ducks, Grey Herons and Tawny Owls. Some unexpectedly early clutches were also started by pairs of Long-eared Owl, Water Rail, Magpie and Wren, while Mallards, Collared Doves and Blackbirds tended healthy broods. This early success was considerably enhanced during a largely dry, settled and sunny March. Clutches of Peregrines, Cormorants, Egyptian Geese, Woodcocks and Woodlarks were

recorded by mid March, while bumper broods of Dippers, Robins, Mistle Thrushes, Long-tailed Tits and Crossbills were free-flying by the month's end.

KINGFISHERS, DIPPERS AND TITS BATTERED BY LATE SPRING DOWNPOURS

Annoyingly, much early nesting season promise was dashed by inclement weather for a third successive April. Winter-like conditions prevailed during the first half of the month. Well-grown broods of Grey Herons, Lapwings, Stonechats, Robins and thrushes all succumbed to the cold, while the wind took its toll of fledgling Rooks, Carrion Crows, Tawny Owls and Woodpigeons.

Regular downpours and rapid snow-melt, led to stressful conditions for many ground-nesting species. Adult Mute Swans and Great Crested Grebes often safely combated rapidly rising water levels, but many cygnets, goslings and ducklings (including those of Eider and Goosander) were saturated, chilled and drowned. Some Black-necked Grebes, Bitterns, Black-tailed Godwits and Bearded Tits were washed out, having initially profited from fresh wetland breeding haunts as a legacy of the winter rains. The wettest April in southern Britain for almost 250 years, checked food supplies and nesting operations by many tits, thrushes and finches, and held back spring migrants. The return of many summer visitors was aided by winds from southern and eastern quarters in late April and early May, when temperatures topped a comfortable 25°C. Populations of Whitethroats, Acrocephalus warblers, martins, Wheatears, Garganeys, Hobbies and Firecrests were buoyant. Cuckoos and Turtle Doves were scarce, while Spotted Flycatchers and Yellow Wagtails were absent from many traditional haunts. Mid May brought a depressing return to unsettled weather, with squally showers and cool days. In some parts of the country, the effects of the wet weather were particularly bad, resulting in huge losses. Stream and lake-side nesting Black-headed Gulls, Kingfishers, Grey Wagtails and Sand Martins suffered repeat losses from flooding in the wettest May since 1993.

SOUTHERN EUROPEAN CELEBRITIES BRIGHTEN AN UNSETTLED JUNE

The uncomfortable, changeable theme persisted throughout much of June, though it was the warmest since 1992 in many areas. Widespread, prolonged downpours on 3rd and 4th, with dramatic flooding in West Yorkshire, swamped coastal seabirds, including burrow-nesting Puffins and other auks on the Farne Islands (for a third successive June); and terns on north and east coasts. Severe gales destroyed some machair shorebird and passerine offspring, forest grouse and finches, moorland raptors and pipits. Finally, came an intense but brief very hot southerly airflow from 17-19th, temperatures topping 33-34°C in the Midlands and East Anglia (in places the highest June values since 1976). Wryneck (Northants), Iberian Chiffchaff (Cornwall), Great Reed Warbler (Lincs and Northants) and Blyth's Reed Warbler (Highland) were reported singing strongly but all failed to attract mates. Spotted Crakes, Quails and Serins enjoyed greater success.

The recent greatly increased wintering populations of Little Egrets and Mediterranean Gulls resulted in the highest breeding numbers yet in the UK. Med Gulls topped 50 pairs, a slow increase since first nesting in 1968. This was largely due to a nucleus of 38 pairs in Langstone Harbour (Hants), though the outlook is promising elsewhere. Several dozen Spoonbills wandered UK wetlands in June, engaging in nesting operations — in SW Scotland (for the first time) and NW England. This follows the first successful breeding in 1998 for over 300 years. Persistent low cloud, regular blustery showers and cool spells, depressed the availability of many aerial insect, wood invertebrate and aquatic food supplies, hitting common and scarce breeding birds alike. Truncated laying seasons and modest sized broods, at best, were features of many nestbox populations of tits, Pied Flycatcher and Redstart. Sea Eagle bucked the downbeat picture: 12 young fledging from eight active nests, involving 19 pairs overall. This matched the 1999 output, in spite of the shameful attentions of several nest collectors. Black

Redstart profited from the extensive redevelopment work in Inner London, pairs at the Thames Barrage and the Millennium Dome providing an extra attraction.

SWIFT AND REED WARBLER DEFY THE DULL UNSETTLED SUMMER

Generally cool, changeable, showery conditions spilled over into the first half of July. Most scrub and leaf warblers (notably Blackcap and Willow Warbler), many Linnets, Yellowhammers, Reed Buntings, Tree and House Sparrows performed poorly overall, nesting activities fading markedly in the dullest summer in the southeast since 1987. Not all was bad though. Regular rains and mild spells suited ground-feeding thrushes, Starlings, Robins and Dunnocks. Goldfinches and Greenfinches were regularly double-brooded in the suburban environment. A sunnier, warmer second half to July, with marked improvements in invertebrate food supplies, helped Hobbies, Swifts and Reed Warblers to rear broods, if often from replacement clutches.

As thundery troughs brought periodic heavy downpours in August, much breeding activity remained low key. By now, though, some Great Crested Grebes, Stone Curlews, Little Ringed Plovers, Nightjars and Swallows had raised two broods, while Blackbirds, Wrens, Pied Wagtails and Stonechats were tending third sets of young. By early September, during a late Indian summer spell, there were reports of Robin, Song Thrush and Stock Dove fledging fourth broods — though these were very much the exceptions.

Modest-sized autumn roosts of wagtails hirundines and thrushes, along with somewhat low capture rates at Constant Effort Sites of certain juvenile tits, warblers and finches were visual legacy of another "below par" year for many. Ironically, after a cold, snowy, late start to nesting operations in April in Scotland, a marginally warmer and drier summer than usual there and in parts of Northern Ireland, favoured certain flagship species. Divers, Golden Eagle, Osprey and a range of forest passerines performed well, Capercaillie enjoyed marginally improved success, but concerns for Red-necked Phalarope and Twite intensified, adding to a topsey turvey season countrywide.

Bird Populations 6:128-131
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BTO News 240:6-7

WORRYING DECLINES — WE NEED YOUR HELP!

HUMPHREY CRICK, ANDY SIMPKIN, PETER BEAVEN AND DAVID GLUE

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The latest results from the BTO's Nest Record Scheme show that poorly performing species such as Reed Bunting and Lapwing are not showing any signs of improvement but, for Linnet, a run of better years provides some grounds for optimism. After the problems of Foot and Mouth disease in 2001, we urgently need your help to improve recording effort in 2002. *Humphrey Crick, Andy Simpkin, Peter Beaven* and *David Glue* report.

DECLIVES PREOCUPANTES – NECESITAMOS TU AYUDA!

Los últimos resultados del Programa de Registro de Nidos del BTO muestran que las especies con bajo éxito reproductivo como el escribano palustre y el avefría no muestran señales de mejoría, pero tras algunos buenos años, el pardillo común parece ofrecer razones para el optimismo. Tras los problemas con la fiebre de las vacas locas en 2001, necesitamos ayuda urgente para mejorar el registro de nidos en 2002. *Humphrey Crick, Andy Simpkin, Peter Beaven* y *David Glue* informan.

DES DECLINS INQUIETANTS – NOUS AVONS BESOIN DE VOUS !

Les derniers résultats du Nest Record Scheme du BTO montrent que les espèces peu performantes comme le Bruant des roseaux et le Vanneau huppé ne semblent pas s'améliorer. En revanche, pour la Linotte mélodieuse, une série de bonnes années pousse à l'optimisme. Après les problèmes de fièvre aphteuse en 2001, nous avons besoin de votre aide d'urgence pour améliorer la collecte de données en 2002. Un rapport de *Humphrey Crick, Andy Simpkin, Peter Beaven* et *David Glue*.

BESORGNISERREGENDE RÜCKGÄNGE – WIR BRAUCHEN IHRE HILFE!

Die neuesten Ergebnisse aus dem Nistkartenprogramm des BTO zeigen, dass abnehmende Arten wie Rohrammer und Kiebitz keine Anzeichen von Verbesserungen zeigen, aber andererseits beim Hänfling nach einer Reihe von guten Jahren wieder Anlass zur Hoffnung besteht. Aufgrund der Probleme, die durch die Maul- und Klauenseuche 2001 für die Monitoringprogramme auftraten, rufen wir dringend zur verstärkten Mitarbeit im Jahr 2002 auf. *Humphrey Crick, Andy Simpkin, Peter Beaven* und *David Glue* berichten.

The BTO's Nest Record Scheme is clearly the best in the world (biggest, most computerised, longest running), but we urgently need to encourage more members to take up nest recording after shortfalls in 2000 and 2001. For those who are not familiar with it, nest recording couldn't be simpler and it is absolutely fascinating! Nest finding is an art that you can develop, but as soon as you find your first nest, or look into your first nestbox, then you are exposed to a whole new world of the private lives of birds. It is also one of the simplest ways for birdwatchers to help monitor the "health" of the UK's birds.

The main raison d'être of the Nest Record Scheme is to monitor for the UK Government

how well our birds are nesting each year . Each year, the BTO sends "alerts" to the UK's Joint Nature Conservation Committee about serious declines in the breeding performance of birds so that this information can be used to decide how and where to spend scarce conservation funds.

Currently there are eight species on the Nest Records Alert List (see Table 1). In the latest analysis (1966-2000), just completed, we have found that six show no change in their overall downward trend, but for one, the Linnet, there have been some promising signs of short-term improvement.

SO, WHAT IS HAPPENING TO EACH OF THESE SPECIES?

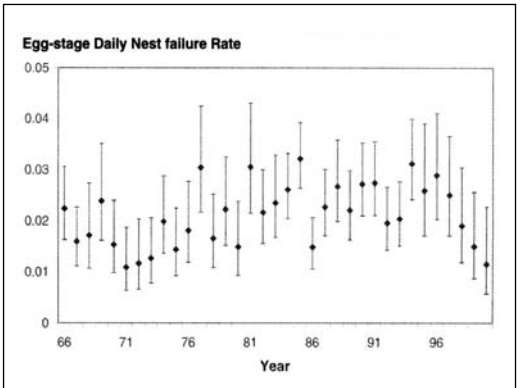
REED BUNTING

The proportion of nests failing at the egg stage has increased from 11% to 37% since 1968. While this is unlikely to have driven the population decline by itself, this increase in nest losses may be helping to hold back the species' recovery. The failure rate in 2000 was particularly high (the second highest on record) with just over half (52%) of all nests failing when nests contained eggs.

LINNET

In contrast with Reed Bunting, although the average failure rate of Linnet nests has increased since 1968 from 38% to 53%, the year 2000 was relatively good. In fact, egg-stage failure rates have fallen steadily for the last five years from 37% in 1996 to 17% in 2000, which is the lowest on record.

So prospects for this species are looking better, reflected in a recent slight upturn in its population trend.



Proportions of nests that failed per day at the egg stage. The points are the yearly averages.

FIGURE 1. Linnet nest failure rates

MOORHEN

Moorhen populations have declined on farmland Common Birds Census plots but have fluctuated widely on waterways monitored by the Waterways Bird Survey and show increases since 1995 on BBS plots. Declines in average clutch size from 6.51 to 6.07 eggs and increases in egg-stage failure rate from 31% to 41% may be indicative of changes in the quality of water bodies where they nest.

LAPWING

A recent detailed analysis of Lapwing breeding performance was described in *BTO News* 239: 10-11. The failure rate of nests at the egg stage has increased from 40% to 49% since 1968, but it is worrying that 2000 was the worst year on record, with 63% failing before hatching. This may have been a reflection of the very cold April weather that affected the UK in that year.

TABLE 1. Nest Records Alert List.

Species	Year of 1st Alert	Reason for alert
Reed Bunting	1991	Increasing egg-stage failures
Linnet	1991	Increasing egg & chick-stage failures
Moorhen	1992	Increasing egg-stage failures & declining clutch size
Red-throated Diver	1995	Increasing egg-stage failures
Lapwing	1995	Increasing egg-stage failures
Ringed Plover	1996	Increasing egg-stage failures
Willow Warbler	1998	Increasing chick-stage failures
Yellow Wagtail	1999	Declining brood size

RINGED PLOVER

The breeding population size of Ringed Plover is not monitored directly by any scheme in the UK and so the Nest Record Scheme provides the only source of information on this species in the summer. It is worrying that its failure rate at the egg stage has increased from 51% to 67%, which may be linked to disturbance by people at its nesting sites. An intensive study on a part of the Norfolk coast has shown that this can be a very important factor.

WILLOW WARBLER

The increase in nesting failure at the chick stage (from 18% to 26%) may be a factor in the current decline of the species. Past declines have been blamed on a reduction in survival rates of birds once they leave the nest and the Constant Effort Sites scheme has shown a substantial decline in productivity in recent years. However, 2000 was actually relatively good for Willow Warbler nesting success with productivity increasing significantly on Constant Effort Sites plots too (*BTO News* 233: 10-11).

RED-THROATED DIVER AND YELLOW WAGTAIL

We are particularly worried that for two of the species, Red-throated Diver and Yellow Wagtail, we received too few records to be able to monitor their breeding performance sufficiently well.

We urgently need BTO volunteers to concentrate on all of the species mentioned in particular and to send in their observations to the Nest Record Scheme. It is the only practical way to ensure monitoring that covers the whole UK.

THINGS CAN ONLY GET BETTER?

For many of the 70 species that are monitored, some aspect of breeding performance has tended to improve since 1968. Clutch size has increased significantly for 13 species, brood size for 27 species, nest survival at the egg stage for 34 species and at the chick stage for 15 species. Some improvements are associated with increasing population size (e.g. Nuthatch and Collared Dove) and the declining influence of organochlorine pesticides, such as DDT, in the environment (e.g. for Sparrowhawk and Buzzard). In some cases positive changes have occurred as populations have declined (e.g. Yellowhammer and Bullfinch). The latter may be because the species has been lost from poorer areas. The converse argument is likely to be responsible, in part, for declines in nesting success for increasing species such as Mute Swan and Great Tit: as they spread into less suitable areas, overall breeding performance may decline.

MILLENNIUM YEAR 2000

This analysis includes data from 2000. The millennium year was rather tricky for many nesting birds. Having been lulled into a false sense of security in a warm early spring, they were hit with a cold April and mixed May and June.

Eleven species laid significantly earlier, on average, in 2000, with five species recording their earliest average laying date in the series since 1968: Robin, Sedge Warbler, Spotted Flycatcher, Starling and Reed Bunting. Only four species started laying significantly later than normal.

Presumably as a result of the warm early spring, average clutch sizes tended to be large, with six species laying significantly larger clutches on average (with Carion Crow and Spotted Flycatcher laying their largest over the time series since 1968) and only three species laying significantly smaller clutches than normal. However, average brood sizes appear to have been affected by the cold wet weather a little later in the season. Eighteen species suffered from significantly smaller brood sizes and only two species enjoyed significantly larger broods.

It was amongst the worst years on record (since 1968) for Grey Heron, Meadow Pipit, Pied Wagtail, Grey Wagtail, Garden Warbler, Crow and Greenfinch. Complete failures of nests were generally within expected levels but Bullfinch suffered significantly high failure rates at the chick stage, and Chaffinch (chick stage), Song Thrush (egg stage) and Willow Warbler (chick stage) enjoyed significantly lower failure rates than normal.

WE REALLY NEED YOUR HELP!

In 2000, we became alarmed by a sudden fall in the numbers of nest records submitted to the

BTO. Numbers fell below the 30,000 mark for the first time since 1985 and this decline not only affected commonly recorded species such as Blackbird, Robin and Dunnock, but also those which are recorded less often and for which every card is treasured. Despite the problems caused in 2001 because of Foot and Mouth Disease, the Nest Record Scheme was relatively well supported and suffered only a reduction of about a third in the numbers of records received. However, it is vital that BTO members go out in 2002, find nests and record them.

Every nest is a part of history that is preserved for posterity and adds importantly to the overall picture. Nest recording is a good example of how you can act locally (record a nest) while thinking globally (contribute to national bird monitoring). For example: volunteers in the 1960s who recorded the nests of House Sparrows and Starlings must have wondered whether this was really worthwhile, given that the species were so common and were considered such pests. But these data are vital now in helping to understand the declines that have occurred since that time.

So, please do go out and record at least one nest, and preferably 10, this year. Each one provides a unique history, whether successful or not and whether it is in your garden or in the countryside. For a free starter pack, including a guide to nest recording and our most recent Nest Record News, please contact Andy Simpkin at BTO Thetford HQ (01842 750050, andy.simpkin@bto.org).

The Nest Record Scheme forms part of the BTO's Integrated Population Monitoring Programme carried out under the BTO/Joint Nature Conservation Committee partnership, and on the behalf of English Nature, Scottish Natural Heritage, the Countryside Council for Wales and the Environment and Heritage Service in Northern Ireland.

Bird Populations 6:132-136
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BTO News 236:12-13

RAVEN AND BUZZARD AMONG STARS AT MIDWINTER BIRDTABLES

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BTO Research Biologist, *David Glue*, reports on findings from Winter 2000/2001, the 31st winter in the BTO's Garden Bird Feeding Survey, and reflects on changes in faces, status and aspects of behaviour at UK birdtables.

CUERVOS Y RATONEROS ENTRE LOS PROTAGONISTAS DE LOS COMEDEROS INVERNALES

El investigador del BTO *David Glue* informa sobre los resultados del invierno 2000-2001, el invierno número 31 del Programa de Aves en Comederos de Jardín, y examina los cambios en las caras, el estatus y la conducta de las aves en los comederos del Reino Unido.

LE CORBEAU ET LA BUSE VARIABLE PARMI LES STARS DES MANGEOIRES EN MILIEU D'HIVER

Le biologiste chercheur *David Glue* expose les découvertes de l'hiver 2000/2001, le 31eme de la Garden Bird Feeding Survey du BTO, et discute des modifications de comportement sur les mangeoires au Royaume-Uni.

KOLKRABEN UND MÄUSEBUSSARD ALS HÖHEPUNKTE AN DEN FUTTERSTELLEN IM MITTWINTER

BTO-Wissenschaftler *David Glue* beschreibt die Ergebnisse aus dem Winter 2000/01, dem 31. Jahr des Gartenvogel-Monitoringprogramms des BTO, und betrachtet die Veränderungen in Arten, Status und Verhaltensweisen an britischen Futterstellen.

In Britain, the concept of deliberately providing scraps for garden birds may seem to be a modern idea but it extends back at least to Elizabethan times. In response to the debate over the "pros" and "cons" of providing supplementary food for garden birds, the BTO launched the Garden Bird Feeding Survey (GBFS) during the winter of 1970/71. It is now in its 31st year.

THE NUMBERS GAME

Today, the garden bird care facility is a multi-million pound business. Year on year, an estimated 15,000 tons of peanuts and over 20,000 tons of wild bird seed are fed to birds in gardens in Britain. Viewed against the background of a sanitized farm landscape with depleted populations of many bird species, and declining bird communities in some of our woodlands, Britain's 16 million homes provide an enormous resource for wildlife.

In winter 2000/2001 (October to March), 278 house-holders recorded weekly peak counts and observations on feeding antics of all species exploiting food-stuffs or water provided in their

gardens. The current gardens included 122 in rural villages, farmsteads and crofts and 156 in town houses, flats and maisonettes, spread widely across the UK.

Overall, a modest 74 species were recorded visiting gardens for food and water. As in each winter, species richness varied widely, reflecting primarily the size and location of the garden. The top rural garden, manned by G H Gush of Ottery St Mary (East Devon), supported 46 species, including Snipe and Water Rail. Sites attracting fewest species (eight) were in built-up areas.

Blue Tit was the only species to patronize all gardens. The top 12 species (Table 1) matched closely those of the previous winter 1999/2000 (*BTO News* 221) and the same dozen species comprised the feeding frequency ratings averaged across the 1990s winters (Table 1), the most striking difference being the decline in the proportion of gardens supporting House Sparrows and Starlings.

As in the previous three winters, which were also mild and wet, gardens in open country settings in winter 2000/2001 were visited by fractionally more species than their counterparts in towns and cities: 20.4 compared with 19.1 species respectively (*BTO News* 231). This contrasts with winter 1995/96, when prolonged spells of severe cold weather, combined with low fruiting yields in the countryside, saw more species turning to birdtables for survival, especially in suburbia (*BTO News* 212).

WINTER COLD SNAPS LIVEN BIRDTABLES

Four major factors strongly influenced the range of species and flock-sizes seen at GBFS sites in winter 2000/2001:

- Another modest breeding season in 2000 for certain single-brooded tits, multiple-brooded doves, thrushes and finches.
- Record-breaking amounts of late autumn and winter rainfall, flooding gardens, property and feeding stations.
- Very high seed crops among many deciduous trees and some conifers.
- Four severe cold spells, from Christmas to late March, often with snow covering and penetrating frosts.

During October, with its unsettled and frost-free weather, Collared Doves, Blackbirds and Greenfinches, brought families from late broods to relatively busy birdtables. Foraging at feeders, though, among seed specialists, such as Coal Tits, Marsh Tits, Nuthatches and Great Spotted Woodpeckers, remained low key (Table 2). An intense Atlantic depression, crossing central Britain from 28th October caused damage to birdtables, feeders, fencing and flattened some trees. Heavy downpours in November, with up to double the normal rainfall, severely saturated gardens. There were garden firsts for some participants of feeding Grey Herons, Mallard and Moorhens together with other more exotic waterfowl. Winter thrushes, Starlings and gulls,

TABLE 1. GBFS Top 12 garden feeding species, Winter 2000/2001 and average for 1990s.

Rank (2000/01)	Species	% of gardens (2000/01)	% of gardens 1990s*
1	Blue Tit	100.0	100
= 2	Blackbird	99.6	99
= 2	Robin	99.6	99
4	Great Tit	98.2	97
5	Dunnock	97.1	95
6	Greenfinch	96.0	96
7	Chaffinch	95.0	96
8	Collared Dove	88.7	86
9	House Sparrow	88.5	93
10	Starling	88.1	93
11	Coal Tit	86.3	85
12	Magpie	73.0	71

** Figures are the average of 10 winters from 1990/91 to 1999/2000.*

TABLE 2. GBFS 12 selected garden feeding species, Winters 1999/2000 and 2000/2001.

Winter	1999/2000	2000/2001
Weather	Very mild and wet	Cold spells, very wet
No. of gardens	279	278
Species	% of gardens	% of gardens
Goldfinch	62	66
Woodpigeon	60	63
Long-tailed Tit	56	64
Siskin	55	42
Song Thrush	55	63
Gr Sp Woodpecker	46	40
Brambling	26	4
Nuthatch	26	23
Blackcap	24	32
Pheasant	20	23
Bullfinch	15	17
Fieldfare	9	8

were largely happy to feed on damp farmland pasture, leys, ploughed land and playing fields, as in the previous winter with few venturing into gardens.

A blast of cold "Arctic" air crossing northern Scotland on Christmas Eve, eventually brought snow and severe frosts to most parts of the UK. Many recorded their first Rooks, Jays, Blackcaps, Pied Wagtails and Bullfinches for the winter at this time. Goldcrests, Treecreepers and Chiffchaffs turned to fatty foods. With damp weather persisting into the New Year, stocks of peanuts were often ignored, or only exploited at low rates.

Freezing blasts of Siberian and Arctic air in the New Year, the coldest spell for four years, resulted in greater numbers of tits, Woodpigeons, thrushes and some finches in gardens. There were reports of birds with wing and tail feathers damaged by snow, and feet affected by ice-balls. Similarly, Chaffinches with leg warts caused by Papillomas virus were widely reported.

Snow blizzards and sharp frosts in early March, the coolest such month for five years, further stimulated birdtable use. There was an upsurge in feeding Blackbirds, Greenfinches, Long-tailed Tits and Yellowhammers. With heavy crops of natural seeds, few Siskins and Redpolls visited gardens for food. Bramblings, frequent visitors in winter 1999/2000, were noticeably scarce. A bumper beech mast crop resulted in their lowest level of garden recording (4% — Table 2) since winter 1976/77 (*BTO News* 202) when just 2% of gardens were patronized. Southerly winds from 27 March brought a welcome, if false, hint of spring and quieter gardens.

GOLDFINCH AND GOLDCREST ADD SPARKLE TO EXTRA UK BIRDTABLES

Composition of the birdtable community has continued to develop. Among regular visitors, five species matched (Pheasant 23%), or exceeded — Goldfinch (66%), Long-tailed Tit (64%), Woodpigeon (63%) and Goldcrest (18%) — all-time high levels of attendance. The striking upsurge in Goldfinches saw new garden feeder use as far afield as Aberystwyth and Perth. Feeding flocks exceeding 50 birds were noted in a number of counties.

Encouragingly, regular feeding flocks of Tree Sparrows were widely recorded. Bullfinches and Yellowhammers continued to display an upturn in feeding numbers. Could improved blends of seed-mixes attract other granivorous birds such as Skylark, Linnet, Meadow Pipit and Corn Bunting to the winter garden environment?

Intriguingly, Buzzards, Ravens and Green Woodpeckers, each currently extending their breeding ranges, are venturing into a thin scatter

CONTRASTING PATTERNS AMONG BIRDS FEEDING AT UK BIRDTABLES. GBFS PEAK COUNT INDEX 1970-2001

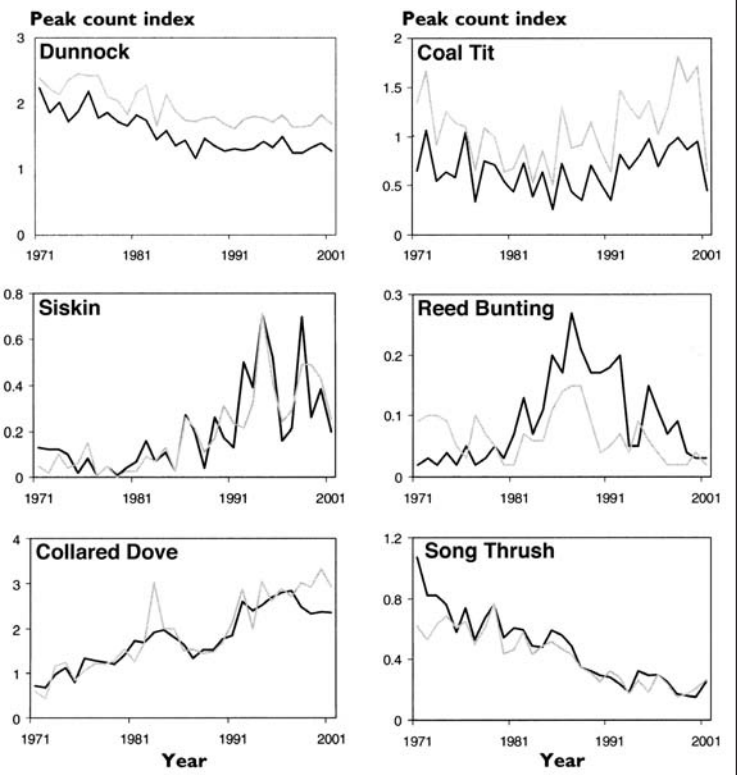
GBFS Peak Count Indices continued to reveal intriguing trends in winter 2000/2001.

The severe decline in House Sparrow and Starling flock sizes continued, reaching all-time lows.

The decline exhibited by Dunnocks in the 1970s has slowed, but this must be treated with caution. This was one of a number of species considered to have benefited from increased human habitation. Song Thrush populations have declined markedly on farmland and woodland and this is reflected in the GBFS feeding numbers over the last 25 years. There are some signs that this decline could be stabilising, at least at present.

Since first breeding in Norfolk in 1955, Collared Dove populations have risen five-fold between 1972 and 1996. Their flock-sizes have plateaued, having seemingly reached saturation in all but western parts and on higher ground. Reed Buntings were formerly regular winter garden visitors, present in good numbers during colder periods in the mid 1980s but today are rarely seen.

Coal Tit feeding numbers are inversely related to the size of beech mast and allied forest seed crops, the heavy crop in autumn 2000 resulting in far fewer feeding and hoarding birds at UK birdtables. Similarly, the recent marked upturn in the numbers of Siskins frequenting nut feeders in the 1990s is severely checked during autumn when conifer seeds are prolific. At such times, many birds stay close to their prime nesting grounds in N Wales, S Scotland, the Highlands and northern forests on the nearby Continent, reducing the numbers visiting gardens.



The Peak Count Index is the average maximum garden count per week.

of gardens in mainly rural locations, exploiting supplementary foods. Buzzards took scraps at feeding stations in the Chilterns, Dartmoor, the Welsh Marches and Highland. Ravens were recorded at sites on Anglesey, Isle of Man, the Pennines and South Wales, displaying a greater tolerance of man. Green Woodpeckers were often drawn initially to ant colonies, exposed by saturated lawns, before turning to windfall apples, fat and grain.

On a less optimistic note, three species dipped to equal or fall below all-time low GBFS levels — House Sparrow (88%), Black-headed Gull (18%) and Reed Bunting (8%) — reflecting recent declines in their breeding status.

WATERFOWL AND WOODPECKERS AMONG SURPRISE GARDEN FEEDERS

Suitably, in a record-breaking wet winter, waterfowl figured among the more exotic garden feeders. Shelduck (Amersham, Bucks), was a new GBFS bird, bringing the 31-year tally to 161 species. Further gardens recorded visiting Mute Swan, Coot, Water Rail and Woodcock. Other lucky home-owners attracted Chough (Pwlleli, Gwynedd), Lesser Spotted Woodpecker (Glossop, Derbys and Ring-necked Parakeet (Bristol and Burnham, Bucks). Several gardens reported visiting Waxwings on *cotoneaster* and *pyracantha*, rose hips and crab apple. These were part of a second successive large winter influx, some 4,000 strong, chiefly to NE Britain.

Some fortunate home-owners noted Hen Harrier (Isle of Man), Merlin (Isles of Scilly, Powys), Peregrine (Gwynedd, Ross-shire) and Little Owl (Gwynedd) chasing or killing prey near feeding stations, adding extra spice to their observations.

We await with great interest to see what the fresh season of recording that beckons will bring.

THANK YOU

CONTINUITY OF RECORDING COUNTS

Frances Bowman, Carol Povey and Jacky Prior kindly helped with production, distribution and collation of forms. The BTO is extremely grateful to the team of GBFS counters for supporting so enthusiastically and faithfully this small but valuable Trust project. Your letters reveal how much you enjoy garden bird recording. Fresh recruits to Garden BirdWatch are always welcome. Contact: Jacky Prior at BTO, Thetford HQ, e-mail jacky.prior@bto.org.

Bird Populations is an annual journal of dynamic global avian demography and biogeography that publishes original research and review papers dealing with changes in the numbers, distributions, and ecological relationships of birds. Papers providing documentation of quantitative changes in bird populations or distributions are preferred, but papers providing baseline population or distribution information are also acceptable. Papers describing or evaluating field techniques or analytical methods for assessing population and distribution changes are also welcome. Contributions are encouraged from throughout the world from both well-known and little-studied avifaunas. *Bird Populations* is published in English with abstracts in Spanish, French, and German.

Authors should submit three complete double-spaced copies of each manuscript, in English, to: David G. Ainley, Editor, *Bird Populations*, H.T. Harvey and Associates, 3150 Almaden Expressway, Suite 145, San Jose, CA 95118. Guidelines for preparing and submitting papers to *Bird Populations*, including the format for literature citations, are similar to those of major American ornithological journals such as *The Auk* and *The Condor*. Authors are urged to examine a recent issue of *Bird Populations* and follow the niceties of the journal's style. All research papers and review articles submitted to *Bird Populations* are subject to peer review. Submission of accepted papers on computer-readable magnetic media (ASCII, MS-Word, or WordPerfect files in MS-DOS or Macintosh format) is encouraged strongly and will be appreciated greatly.

Bird Populations also prints or reprints annual reports of major avian monitoring programs from around the world. These annual reports are an important focus of the journal which is intended to serve as a yearbook on the status of the Earth's birdlife by bringing together, under a single cover, information from many widespread localities on the annual changes in the abundance and distribution of birds. We believe that the printing or reprinting of these annual reports will draw attention, in a timely manner, to short-term population fluctuations that may turn out to be geographically widespread or that may signal the beginnings of longer-term trends. We hope that the publication of these reports will provide ornithologists with a global informational network for addressing avian population changes, will encourage an integrative global approach to avian monitoring studies, will stimulate the establishment of additional avian monitoring programs, particularly in the developing nations, and ultimately will aid in the conservation of global avian diversity.

Any agency or organization from anywhere in the world conducting a long-term, relatively large-scale, standardized, avian monitoring program is invited to submit the annual (or biennial) report of that program to *Bird Populations* for printing or reprinting. Annual reports submitted for original printing will undergo peer review; please submit three copies of such reports. Already published annual reports submitted for reprinting will not be peer reviewed, but will be screened by the Editor when first submitted with regard to the scope and scientific merit of the monitoring program and the appropriateness of the methods and analyses; please submit one copy of such reports. Annual reports of programs included for publication will be printed or reprinted without page charges. Submission of reports on computer-readable magnetic media is encouraged and will be appreciated.

BIRD POPULATIONS

A journal of global avian demography and biogeography

Volume 6 2001-2002

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