

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

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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, Japanetze, 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 underwritten 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 micro-habitat 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 micro-habitat 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

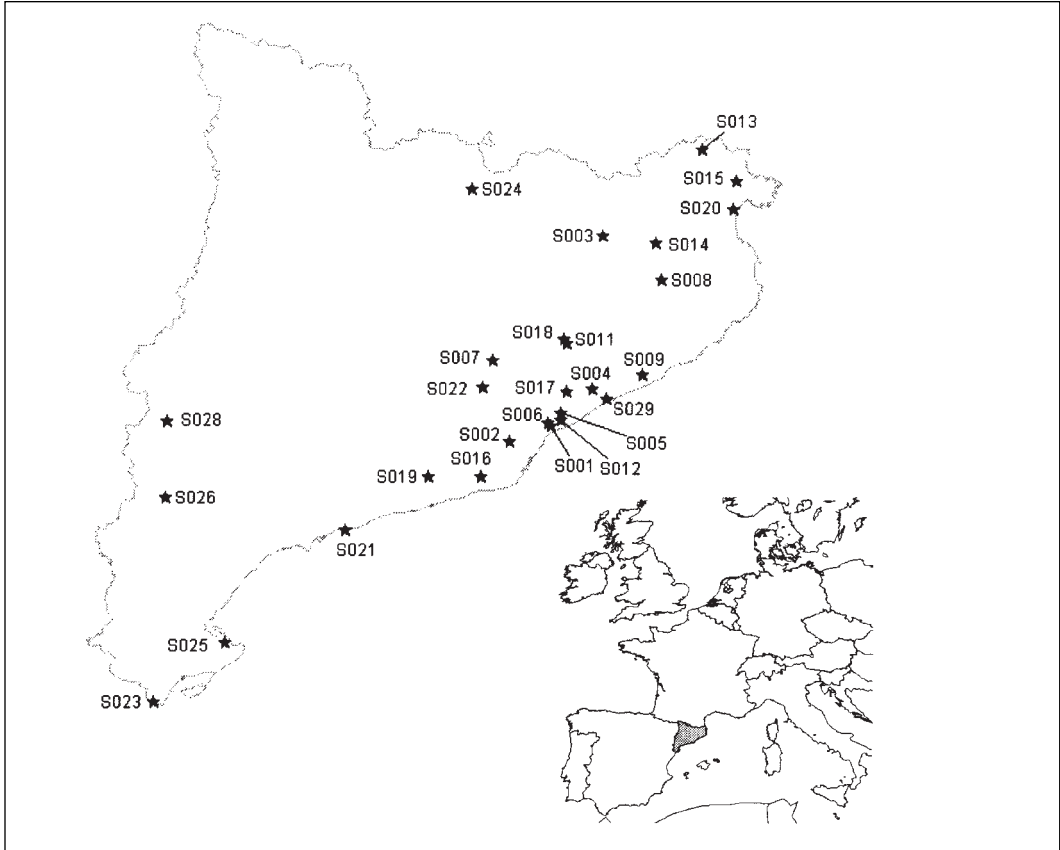


FIGURE 1. Locations of the 27 SYLVIA sites operating in 2000. See Table 1 for site codes.

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						Species All Years
					2000		All years combined				
					Ringed	Recapture	Ringed	Recapture	Ringed	Recapture	
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	Estany 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.

Species	Adults						Juveniles						Proportion of juveniles				
	1999		2000		Percent	SE	1999		2000		Percent	SE	1999		2000		
	n	aged	n	aged	SE	n	aged	n	aged	SE	n	aged	Prop.	aged	Prop.	aged	
<i>Troglodytes troglodytes</i>	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
<i>Erethacus rubecula</i>	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
<i>Luscinia megarhynchos</i>	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
<i>Turdus merula</i>	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
<i>Turdus philomelos</i>	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
<i>Cettia cetti</i>	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
<i>Acrocephalus scirpaceus</i>	1	85	106	24.7		1	63	95	50.8		1	148	0.426	201	0.473	0.047	
<i>Acrocephalus arundinaceus</i>	1	14	22	57.1		1	6	9	50.0		1	20	0.300	31	0.290	-0.010	
<i>Hippobolais polyglotta</i>	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
<i>Sylvia cantillans</i>	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
<i>Sylvia melanocephala</i>	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
<i>Sylvia atricapilla</i>	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
<i>Regulus ignicapillus</i>	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
<i>Aegithalos caudatus</i>	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
<i>Parus caeruleus</i>	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
<i>Parus major</i>	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
<i>Certhia brachydactyla</i>	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
<i>Passer domesticus</i>	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
<i>Fringilla coelebs</i>	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
<i>Serinus serinus</i>	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
<i>Carduelis chloris</i>	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
<i>Carduelis carduelis</i>	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
<i>Troglodytes troglodytes</i>	13	84	0.536	0.102
<i>Erithacus rubecula</i>	16	317	0.700	0.032
<i>Luscinia megarhynchos</i>	24	276	0.322	0.036
<i>Turdus merula</i>	24	587	0.606	0.050
<i>Turdus philomelos</i>	10	33	0.636	0.120
<i>Cettia cetti</i>	12	131	0.710	0.071
<i>Acrocephalus scirpaceus</i>	5	506	0.435	0.051
<i>Acrocephalus arundinaceus</i>	4	68	0.353	0.046
<i>Hippolais polyglotta</i>	19	188	0.277	0.050
<i>Sylvia cantillans</i>	16	137	0.628	0.049
<i>Sylvia melanocephala</i>	20	637	0.645	0.069
<i>Sylvia atricapilla</i>	18	399	0.692	0.038
<i>Regulus ignicapillus</i>	12	32	0.531	0.102
<i>Aegithalos caudatus</i>	16	133	0.669	0.064
<i>Parus caeruleus</i>	16	133	0.549	0.072
<i>Parus major</i>	23	272	0.647	0.084
<i>Certhia brachydactyla</i>	16	83	0.494	0.068
<i>Passer domesticus</i>	17	272	0.213	0.078
<i>Fringilla coelebs</i>	7	32	0.344	0.110
<i>Serinus serinus</i>	20	119	0.303	0.080
<i>Carduelis chloris</i>	14	65	0.215	0.068
<i>Carduelis carduelis</i>	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.

Species	Ageing reliability	n	1999		2000		Change	SE
			Aged	Prop.	Aged	Prop.		
<i>Troglodytes troglodytes</i>	++	6	15	0.667	16	0.750	0.083	0.215
<i>Erithacus rubecula</i>	++	8	56	0.554	59	0.610	0.057	0.128
<i>Luscinia megarhynchos</i>	+	10	77	0.519	76	0.566	0.046	0.084
<i>Turdus merula</i> (male)	++	9	72	0.292	66	0.515	0.223	0.123
<i>Turdus merula</i> (female)	+++	11	54	0.278	54	0.685	0.407	0.105
<i>Sylvia melanocephala</i> (male)	+++	5	30	0.700	12	0.583	-0.117	0.133
<i>Sylvia melanocephala</i> (female)	+++	6	18	0.556	16	0.750	0.194	0.205
<i>Sylvia atricapilla</i> (male)	+++	7	41	0.585	33	0.818	0.233	0.165
<i>Sylvia atricapilla</i> (female)	+++	5	15	0.667	20	0.750	0.083	0.135
<i>Parus caeruleus</i>	+	8	27	0.333	33	0.455	0.121	0.162
<i>Parus major</i> (male)	+	6	13	0.462	20	0.600	0.138	0.199
<i>Parus major</i> (female)	+++	7	11	0.455	17	0.765	0.310	0.210
<i>Serinus serinus</i>	-	7	34	0.676	23	0.652	-0.024	0.188
<i>Carduelis chloris</i>	-	4	16	0.500	12	0.667	0.167	0.198
<i>Carduelis carduelis</i>	-	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 these 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
<i>Troglodytes troglodytes</i>	++	10	30	0.667	0.119
<i>Erithacus rubecula</i>	++	13	90	0.622	0.069
<i>Luscinia megarhynchos</i>	+	20	171	0.573	0.050
<i>Turdus merula</i> (male)	++	22	126	0.468	0.064
<i>Turdus merula</i> (female)	+++	20	86	0.628	0.070
<i>Sylvia melanocephala</i> (male)	+++	14	113	0.549	0.084
<i>Sylvia melanocephala</i> (female)	+++	13	98	0.643	0.089
<i>Sylvia atricapilla</i> (male)	+++	11	66	0.788	0.056
<i>Sylvia atricapilla</i> (female)	+++	9	37	0.838	0.085
<i>Parus caeruleus</i>	+	15	59	0.441	0.072
<i>Parus major</i> (male)	+	19	51	0.627	0.077
<i>Parus major</i> (female)	+++	16	34	0.706	0.094
<i>Serinus serinus</i>	-	18	73	0.575	0.078
<i>Carduelis chloris</i>	-	12	43	0.512	0.099
<i>Carduelis carduelis</i>	-	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.

Site Code	Station name	Years	Periods	Capture index	Number of captures				Number species	All years
					2000-01		All years combined			
					Ringed	Recaptured	Ringed	Recaptured	2000-01	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
<i>Troglodytes troglodytes</i>	7	16	6	-62.5	14.4*
<i>Prunella modularis</i>	8	35	20	-42.9	19.4*
<i>Erithacus rubecula</i>	8	128	152	18.8	23.6
<i>Turdus merula</i>	8	68	67	-1.5	16.4
<i>Turdus philomelos</i>	8	36	26	-27.8	21.2
<i>Cettia cetti</i>	5	8	12	50.0	79.1
<i>Sylvia melanocephala</i>	8	38	51	34.2	19.0
<i>Sylvia atricapilla</i>	8	125	108	-13.6	10.1
<i>Phylloscopus collybita</i>	8	67	50	-25.4	19.3
<i>Regulus ignicapillus</i>	8	32	57	78.1	26.6*
<i>Aegithalos caudatus</i>	8	56	65	16.1	33.0
<i>Parus caeruleus</i>	8	55	52	-5.5	42.0
<i>Parus major</i>	8	50	34	-32.0	11.7
<i>Fringilla coelebs</i>	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		99-00		00-01		99-00		00-01					
		n	Percent	SE	SE	n	Percent	SE	SE	n	Aged Prop.	Aged	Prop.	Change	SE		
<i>Troglodytes troglodytes</i>	-	6	-62.5	20.5	3	2	-66.7	30.4	4	10	0.500	5	0.400	-0.100	0.268		
<i>Erithacus rubecula</i>	+	8	-34.8	21.7	30	81	120	48.1	45.0	8	127	0.638	150	0.800	0.162	0.108	
<i>Turdus merula</i> (male)	++	8	33.3	77.1	20	14	16	14.3	31.0	7	29	0.483	31	0.484	0.001	0.222	
<i>Turdus merula</i> (female)	+	8	-50.0	12.1*	7	24	21	-12.5	26.9	7	37	0.649	28	0.750	0.101	0.084	
<i>Sylvia melanocephala</i> (male)	+	5	0.0	39.5	8	11	19	72.7	50.1	7	19	0.579	26	0.692	0.113	0.123	
<i>Sylvia melanocephala</i> (female)	+++	6	75.0	119.0	7	13	16	23.1	47.9	7	17	0.765	22	0.682	-0.083	0.157	
<i>Sylvia atricapilla</i> (male)	-	6	-18.2	34.7	9	48	39	-18.8	13.8	8	59	0.814	48	0.813	-0.001	0.095	
<i>Sylvia atricapilla</i> (female)	-	6	2	550.0	13	43	39	-29.5	11.5	8	63	0.968	56	0.768	-0.200	0.057*	
<i>Parus caeruleus</i>	++	8	-31.6	27.8	13	36	39	8.3	53.0	8	55	0.655	52	0.750	0.095	0.071	
<i>Parus major</i> (male)	+	7	-63.6	13.9*	4	18	16	-11.1	24.9	7	27	0.630	20	0.800	0.170	0.088	
<i>Parus major</i> (female)	++	4	-40.0	37.5	3	15	10	-33.3	30.8	5	20	0.750	12	0.750	0.000	0.149	
ALL SPECIES POOLED		8	-17.4	14.6	119	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 Catalanian 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.

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LITERATURE CITED

BAILLIE, S. R. 1995. Uses of ringing data for the conservation and management of bird populations: a ringing scheme perspective. *J. Appl. Stat.* 22: 967-987.

BAILLIE, S. R., R. E. GREEN, M. BODDY AND S. T. BUCKLAND. 1986. An evaluation of the Constant Effort Sites Scheme. British Trust for Ornithology, Thetford, U.K.

BAIRLEIN, F. (comp.) 1995. European-African Song Bird Migration Network: Manual of Field Methods (revised edition). European Science Foundation, Wilhelmshaven.

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

- DESANTE, D. F. 1995. Suggestions for future directions for studies of marked migratory landbirds from the perspective of a practitioner in population management and conservation. *J. Appl. Stat.* 22: 949-965.
- DESANTE, D. F., AND K. M. BURTON. 1997. MAPS manual. The Institute for Bird Populations, Point Reyes Station, CA.
- DESANTE, D. F., K. M. BURTON, AND O. E. WILLIAMS. 1993. The Monitoring Avian Productivity and Survivorship (MAPS) program, 2nd An. Rept. (1990-1991). *Bird Popul.* 1: 68-97.
- DESANTE, D. F., AND D. K. ROSENBERG. 1998. What do we need to monitor in order to manage landbirds? *In Avian Conservation: research and management* (J.M. Marzluff, and R. Sallabanks, eds). Island Press, Washington.
- EVANS, A. D., A. G. GOSLER AND J. D. WILSON. 1999. Increasing the conservation value of ringing studies of passerines, with emphasis on the non-breeding season. *Ring and Migr.* 19 (suppl.): 107-117.
- KAISER, A. 1993. A new multi-category classification of sub-cutaneous fat deposits of songbirds. *J. Field Ornithol.* 64: 246-255.
- MARCHANT, J. H., C. FORREST AND J. D. GREENWOOD. 1998. A review of large-scale generic population monitoring schemes in Europe. 2nd ed. BTO Res. Rept. 165.
- PEACH, W., S. BAILLIE AND L. UNDERHILL. 1991. Survival of British Sedge Warblers *Acrocephalus schoenobaenus* in relation to west African rainfall. *Ibis* 33: 300-305.
- PEACH, W. J., H. Q. CRICK AND J. H. MARCHANT. 1995. The demography of the decline in the British Willow Warbler population. *J. Appl. Stat.* 22: 905-922.
- PEACH, W. J., R. W. FURNESS AND A. BRENCHELY. 1999. The use of ringing to monitor changes in the numbers and demography of birds. *Ring and Migr.* 19 (suppl.): 57-66.
- POLLOCK, K. H., J. D. NICHOLS, C. BROWNIE AND J. E. HINES. 1990. Statistical inference for capture-recapture experiments. *Wildl. Monogr.* No. 107.
- SVENSSON, L. 1992. Identification Guide to European Passerines. 4th ed. Stockholm.
- TUCKER, G. M. AND F. HEATH, 1994. Birds in Europe: their conservation status. BirdLife International, Cambridge UK.
- WINSTANLEY, D., R. SPENCER, AND K. WILLIAMSON 1974. Where have all the Whitethroats gone? *Bird Study* 2: 1-14.

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