The Catalan Common Bird Survey (SOCC): a tool to estimate species population numbers

Sergi Herrando, Lluís Brotons, Joan Estrada & Vittorio Pedrocchi

The SOCC (*Seguiment d'Ocells Comuns a Catalunya*) is the Catalan common bird survey, a programme promoted to quantify temporal trends in the abundance of common birds in Catalonia (NE Spain). Although the main aim of the SOCC is to determine population trends for breeding and wintering birds, the integration with high resolution distribution maps obtained through habitat suitability models in the context of the Catalan Breeding Bird Atlas has proven to be an interesting tool to estimate the population size of many common species, for which earlier estimates where completely unknown or based on pure speculation. We built regression models (Atlas-SOCC models) that relate the densities of the SOCC transects (pairs/km^2) to the probability of occurrence (ranging from 0 to 1) for the sample of 1x1 km UTM squares in which transects were located. Model fit was highly significant in many cases, thus allowing the projection of species densities to non surveyed areas from which the probability of occurrence had been assessed. The Atlas-SOCC models were used to predict densities for each of the 1x1 km UTM squares of Catalonia, and then we added all these values in order to obtain population estimates for the whole country. Our approach stresses the interest of combining results from different monitoring programmes to obtain data useful to establish bird conservation strategies.

Key words: population estimate, monitoring programme, bird survey, atlas project, density *vs*. probability of occurrence, SOCC.

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Bird monitoring schemes have an unquestionable interest for the conservation of both the birds and their habitats (Furness & Greenwood 1993). Many monitoring programmes have been running in central and northern Europe for several decades but their consolidation in Mediterranean countries has been rather poor until recent times (Vorísek & Marchant 2003). The first Catalan Breeding Bird Atlas (Muntaner *et al.* 1984) constituted one of the first attempts to improve this situation and represented a milestone that increased the interest for birds in Catalonia (Ferrer 2004). Since then, this interest has crystallised in many ways, from tens of theses to the establishment of a complete and extensive network of constant effort ringing sites, the SYLVIA project (GCA 2002). One of the most recent initiatives has been the launching of the Catalan Common Bird Survey (SOCC). Although the main aim of the SOCC is to determine population trends for breeding and wintering birds, its integration with high resolution distribution maps from the Catalan Breeding Bird Atlas (Estrada *et al.* 2004) has proven to be an interesting tool to estimate the population size of many common birds.

Generating reliable population estimates for bird species represents an important step to determine its conservation status and, consequently, to develop appropriate conservation policies (UICN 2001). Therefore, a special effort has been carried in Europe to estimate bird populations at national and continental scales (Hagemeijer & Blair 1997, BirdLife International/EBCC 2000). This also has great relevance at a regional level, especially in cases such as that of Catalonia, a Spanish Autonomous Community which, regarding environmental matters, has a higher legal responsibility than the State itself.

In this context, an effort was made to integrate the results of the main census projects that are currently running in Catalonia to address this question. The general approach was to combine the presence/absence Atlas data in 1x1 km squares (Estrada *et al.* 2004), with estimates of bird densities from SOCC transects. The initial assumption guiding our approach was that the probability or frequency of occurrence of a species (which ranges from 0 to 1) in an area was related to its absolute abundance or density. A first approach to this relationship was done in the New Atlas of the Breeding Birds of Britain and Ireland (Gibbons *et al.* 1993). A few years later Robertson *et al.* (1995) took another step forward and estimated the population size of four species from a statistical model using data from the Atlas of South African Birds (Harrison *et al.* 1997) and absolute densities derived from transects. Recently, the Atlas of the Breeding Birds in The Netherlands has also run regression analyses between absolute densities (from Common Bird Census data) and relative densities obtained (from Atlas data) to estimate the national breeding population of many common species (SOVON 2002). A practical requirement to apply this approach is the availability of both an abundance index (e.g. frequency of occurrence over a given period of time) for the total study area and a well distributed census network capable of providing absolute abundances. The overlap of the sampling periods for the Catalan Breeding Bird Atlas and the SOCC programme has allowed the application of this approach in Catalonia. This resulted in estimates of the population size of many common species. Earlier estimates were completely unknown or based on pure speculation.

Methodology

Density source

The census methodology used in the SOCC project provides an opportunity to gather a good sample of standardised density values. Distance estimates are essential for determining densities in transect censuses, since each species has its own detectability level; that is, some species are more conspicuous than others and hence are detected farther from the observer (Bibby *et al.* 2000). The SOCC programme has two variants of variable complexity: the standard SOCC and the expanded SOCC. In the first type, the observer records every bird without taking into account the distance at which the bird is located; on the other hand, distance in the expanded SOCC is assessed in bands (0-25 m, 25-100 m and >100 m). To obtain specific detectability coefficients we used data from the expanded SOCC (n= 49 transects) and Jarvinen & Väisänen's formulae (1975), which assume linear detectability functions. These coefficients (k) were calculated for every species for which we could assume that the method did not give biased results. This excluded nocturnal and crepuscular species, since censuses were conducted during the morning, and aerial species such as swifts, swallows, bee-eaters and raptors, since it is very difficult to reliably estimate the distance of flying birds.

Specific detectability coefficients have been used to calculate species density in each transect according to the formula $D=(1000 * N * k) / L$, in which D is the density in individuals/km^2, N the number of species contacts, k the detectability coefficient and L the transect length in metres (Jarvinen & Väisänen 1975). This calculation was not only made for the expanded SOCC transects, but also for all SOCC transects, since once the k were obtained, this formula allows the assessment of densities in transects without bands. Although it is foreseeable that differences in detectability will exist depending on the specific habitat composition of each transect, we assumed that the habitat composition of the 49 expanded SOCC transects was a representative sample of the overall SOCC network. We also assumed that the detectability functions assessed using data from the observers that participate in the expanded SOCCs were comparable with those of the whole set of SOCC transects. This factor could introduce some bias, but we believe that it is likely to be of little relevance given that data of doubtful quality was excluded from the analyses. Finally, density estimates were obtained for a subset of 174 SOCCs.

Densities obtained up to this point refer to individuals and, in particular, to those being usually detected in spring field sampling. Therefore, figures refer to a heterogeneous mixture of males, females and juveniles, all in different proportions depending on the species' reproductive phenology and behaviour. For this reason, comparison across species is difficult. This is a good reason to go one step further and express densities in terms of number of pairs/km^2, a procedure that is, moreover, the commonest way of describing densities during the breeding season (*e.g.* Hagemeijer & Blair 1997). To deal with this problem we used data from the expanded SOCC transects again, in which observers distinguish males from the rest of contacts; thus allowing us to assess the ratios males/total number of detected birds. However, the problem is more complex since among the unsexed individuals were actually yearlings, females and some undetected males, which do not have the same detectability. Thus, it was necessary to study the model in greater depth and incorporate data from the SYLVIA project (GCA 2002), the Catalan network of constant effort ringing sites, where most captured individuals are correctly sexed and aged. Thus, for each species we constructed a linear model in which the dependent variable was the corrective factor transforming individuals into pairs and the predictive variables were the percentage of males identified in the expanded SOCC and the proportion of males in the population (SYLVIA data). This coefficient fluctuated according to the species from 0.2 to 1 and was closely related to the number of juvenile birds and differences in detectability between males and females (see Estrada *et al.* 2004 for more details on this methodology). In this way, we were able to assess common bird densities in terms of pairs/km^2 for each of the 174 SOCCs.

Relative abundance index maps

In the Catalan Breeding Birds Atlas we estimated the probability of occurrence of a species (ranging from 0 to 1) at each of the 1x1 UTM squares of the Catalan territory by applying niche-based models (Guisan & Zimmermann 2000) to the presence/absence data collected in a sample of approximately 10% of the 1x1 UTM squares of Catalonia (3,077). We selected niche-based models instead of those based on interpolation techniques like co-krigging because of the superior capacity of the former in making use of a large number of environmental variables in the modelling process (Guisan & Zimmerman 2000)

The models developed allow us to estimate each species' response to a series of environmental variables and thereby obtain the predicted probability of occurrence for each species at each one of the Catalan 1x1 UTM squares. We used a cross-validation procedure to evaluate the accuracy of model predictions (Guisan & Zimmermann 2000) using 30% of data to evaluate the results of the model. The area under the ROC curve (AUC) was used as the main indicator of model performance and only models with an AUC higher than 0.7 were finally considered in this study. See Estrada *et al.* (2004) for more details on this methodology

The Atlas-SOCC model

The Atlas-SOCC model is the name we have given to the procedure used to produce the estimates of population sizes for common bird species. Each SOCC transect is 3-km long and essentially straight, thus crossing on average approximately 3 1x1 UTM squares. This allowed us to build a statistical model for each species in order to relate the absolute abundance (pairs/km^2) of the SOCC transect to the mean abundance index (from 0 to 1) of the three 1x1 UTM squares in which transects are located. We believe that those species that are characteristic of linear or patchily distributed habitats such as rivers and cliffs are not well sampled by this approach, because only rarely does the SOCC transects represent these habitats well enough to obtain reliable absolute densities. Consequently, species such as the Blue Rock Thrush, Cetti's Warbler and Moorhen have not been evaluated by means of the Atlas-SOCC model.

To determine the statistical relationship between the absolute abundance (dependent variable, SOCC data) and the abundance index (independent variable, atlas data), we used an exponential Poisson model. This is because the abundance index ranges from 0 to 1, while the SOCC estimate often has a value of 0 but may exceed 50 pairs/km^2. Another aspect taken into account by this model is the fact that the SOCC transects are not homogeneously distributed across the country. To minimise this bias, we weighted the contribution of each transect to the model by its biogeographical representatives. This was assessed as the relation between the total area of each biogeographical region in the whole set of 1x1 UTM squares where SOCCs were located and the total area of this region in Catalonia (Figure 1). Once performed, we rejected non-significant models ($p>0.05$), as well

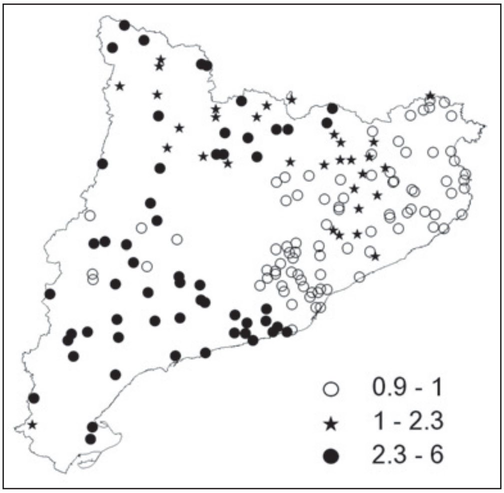

Figure 1. Location of the 174 SOCC transects included in the model abundance index/absolute density and their relative weights. The values represent the relation between the total area of each biogeographical region in the 1x1 UTM squares where SOCCs are located and the total area of this region in Catalonia. These were used to calculate the importance of each transect in the model in terms of whether the region was well (low values) or poorly (high values) represented in the SOCC network.
Localització dels 174 transectes SOCC inclosos en els models índex d'abundància / densitat absoluta i la seva importància relativa. Aquests valors representen la relació entre la superfície de cada regió biogeogràfica en els quadrats UTM 1x1 on els SOCCs es localitzaven i la superfície total d'aquesta regió biogeogràfica a Catalunya. Aquests valors es van utilitzar per calcular la importància de cada transecte en el model considerant que la regió on es troba està ben representada (valors baixos) o mal (valors alts) a la xarxa SOCC.

as those with a very low explained variance ($r^2>0.2$) and those which included zero within the confidence interval of the estimate. Regression models were carried out with the S-Plus statistical software package (Anon 1999).

Finally, the absolute abundance for each of the almost 32,000 1x1 UTM squares in Catalonia were predicted and all these estimates were added to obtain the Catalan population of each species (Figure 2). The model did not only give a predicted abundance estimate for each square, but also its 95% confidence intervals. Thus, each 1x1 UTM square had minimum and maximum estimated values and, hence, the sum of these values, respectively, allowed us to calculate minimum and maximum population estimates for each species in Catalonia. One final assumption of this methodology was that the predicted densities could never be greater than those observed in the SOCC. Consequently, final densities were topped off with this maximum. We believe that this procedure is fairly conservative, but, at the same time, realistic.

We established three categories to estimate the accuracy of these population estimates: acceptable, good and very good:

1) Acceptable: when the detectability estimates (k) were assessed with <5 expanded SOCC transects or <50 contacts, or the model was calculated on a basis of <10 SOCCs.
2) Good: when the detectability estimates (k) were assessed with 5 to 10 expanded SOCC transects, the r^2 of the model was between 0.2 and 0.4, or the model was calculated on a basis of <20 SOCCs.
3) Very good: the rest of the estimates, with $r^2>0.4$, calculated on a basis of >20 SOCCs and with detectabilities assessed with >50 contacts and >10 expanded SOCC transects.

Results

Population estimates were obtained for a set of 65 breeding bird species (Table 1), which, considering that 232 species breed in Catalonia (Estrada *et al.* 2004), represents the 28% of the total breeding birds.

It was not possible to calculate this type of estimates for the following groups of species:

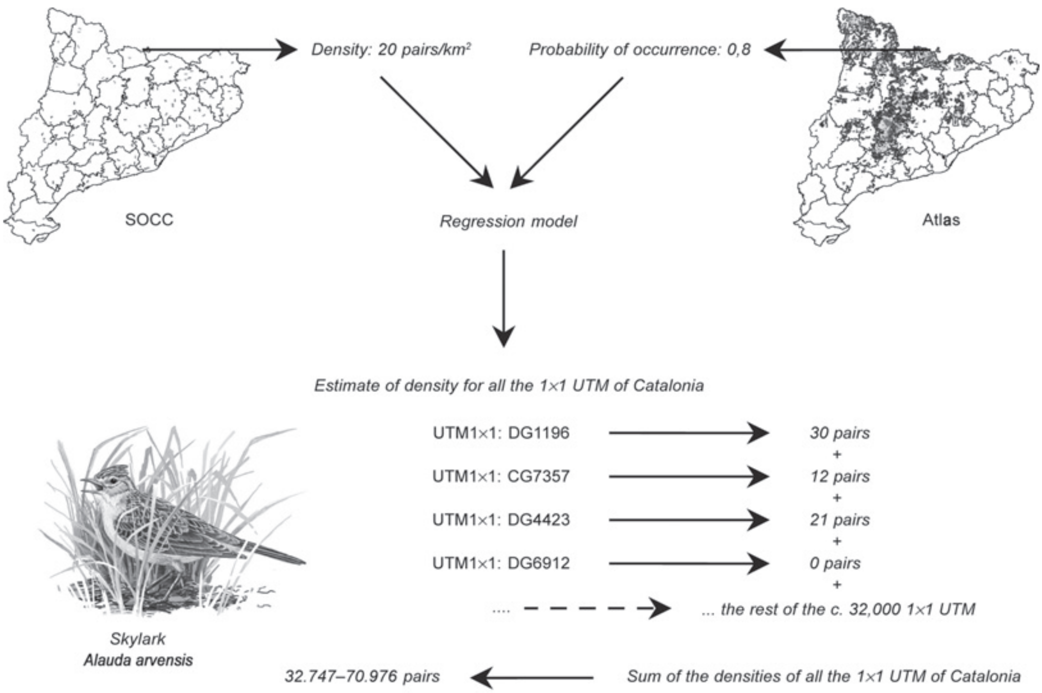

Figure 2. Schematic representation of the Atlas-SOCC model procedure for the Skylark. Once the densities of each SOCC transect were determined and its abundance index map was generated, a regression model was made between such densities (dependent variable, SOCC data) and the probability of occurrence (independent variable, Atlas data). Then the model was applied to estimate densities for each 1x1 km UTM square of the territory and all these values were added to obtain the number of Skylark pairs breeding in Catalonia.
Representació esquemàtica del model Atles-SOCC per a l'alosa vulgar. Un cop determinades les densitats de cada SOCC i generat el mapa d'índex d'abundància de l'espècie, es va construir un model de regressió entre aquestes densitats (variable depenent, dades SOCC) i la probabilitat d'aparició (variable independent, dades Atles). Un cop fet això, es va aplicar el model per estimar les densitats de cada quadrat UTM 1x1 km del territori i es van sumar tots els valors obtinguts per obtenir el nombre de parelles d'alosa vulgar que nidifiquen a Catalunya.

1) those with a low sample size in the SOCC project,
2) those for which the census method did not allow densities to be obtained,
3) those for which densities obtained could not be extrapolated to the set of three 1x1 UTM squares in which the transect was located and,
4) those for which the statistical model did not provide satisfactory results ($p>0.05$, $r^2>0.2$, confidence intervals >100%).

In spite of this, we feel that this approach has been very successful. These 65 birds constitute a set of common species for which it had been hitherto very difficult to evaluate population numbers, and whose population estimates were often pure speculation or, at best, calculated by means of comparisons with published data. The quality of the results for this set of species, however, was not homogeneous: a total of 11 species attained an acceptable accuracy, 27 a good accuracy and another 27 a very good accuracy (Table 1).

The most abundant species in Catalonia was the House Sparrow, with a population estimate ranging from 2,643,851 to 3,814,789 breeding pairs, 3-4 times higher than that of the next four species of the ranking: the Nightingale, the Robin, the Serin and the Great Tit (Table 1). Abundant species not analysed, such as swallows and swifts, seem to rank far from these figures (Estrada *et al.* 2004). At the opposite end, the less abundant species for which this meth-

Table 1. Population estimates (mean, minimum and a maximum for a confidence level of 95%, and accuracy) for the 65 species for which the Atlas-SOCC model gave reliable results. See methodology for explanation on accuracy criteria.
Estimes poblacionals (mitjana, mínim i màxim per a un interval de confiança del 95%, i fiabilitat) de les 65 espècies per a les quals el model Atles-SOCC va donar resultats fiables. Vegeu la metodologia per a més explicacions sobre els criteris de fiabilitat.

English name	Scientific name	Mean	Min.	Max.	Accuracy
Red-legged Partridge	*Alectoris rufa*	55,081	31,285	78,877	Good
Common Quail	*Coturnix coturnix*	13,097	5,347	20,847	Acceptable
Woodpigeon	*Columba palumbus*	237,153	198,729	275,576	Good
Collared Dove	*Streptopelia decaocto*	82,243	56,884	107,601	Very good
Cuckoo	*Cuculus canorus*	20,869	16,582	25,155	Good
Hoopoe	*Upupa epops*	78,414	61,095	95,734	Very good
Green Woodpecker	*Picus viridis*	50,344	38,857	61,832	Good
Great Spotted Woodpecker	*Dendrocopos major*	21,518	14,036	29,000	Good
Calandra Lark	*Melanocorypha calandra*	38,653	27,218	50,088	Acceptable
Crested Lark	*Galerida cristata*	147,064	94,421	199,707	Very good
Thekla Lark	*Galerida theklae*	12,890	7,310	18,469	Acceptable
Woodlark	*Lullula arborea*	103,836	70,781	136,891	Good
Skylark	*Alauda arvensis*	51,859	32,743	70,976	Good
Tawny Pipit	*Anthus campestris*	5,575	1,639	9,511	Acceptable
Tree Pipit	*Anthus trivialis*	11,552	4,306	18,798	Good
Wren	*Troglodytes troglodytes*	388,772	314,061	463,483	Very good
Dunnock	*Prunella modularis*	71,364	50,629	92,100	Very good
Robin	*Erithacus rubecula*	931,576	778,512	1,084,639	Very good
Nightingale	*Luscinia megarhynchos*	987,172	837,842	1,136,503	Very good
Black Redstart	*Phoenicurus ochruros*	52,970	35,981	69,959	Very good
Wheatear	*Oenanthe oenanthe*	15,178	8,597	21,760	Good
Black-eared Wheatear	*Oenanthe hispanica*	21,080	16,522	25,637	Acceptable
Ring Ouzel	*Turdus torquatus*	7,926	1,791	14,061	Acceptable
Blackbird	*Turdus merula*	837,230	744,170	930,290	Good
Mistle Thrush	*Turdus viscivorus*	83,626	64,033	103,219	Very good
Fan-tailed Warbler	*Cisticola juncidis*	48,429	26,596	70,261	Acceptable
Melodious Warbler	*Hippolais polyglotta*	155,908	101,548	210,269	Good
Blackcap	*Sylvia atricapilla*	530,731	428,149	633,314	Good
Orphean Warbler	*Sylvia hortensis*	15,747	3,421	28,074	Acceptable
Dartford Warbler	*Sylvia undata*	46,131	20,138	72,125	Very good
Subalpine Warbler	*Sylvia cantillans*	306,817	158,947	454,687	Good
Sardinian Warbler	*Sylvia melanocephala*	465,501	376,099	554,903	Very good
Bonelli's Warbler	*Phylloscopus bonelli*	255,433	184,120	326,745	Good
Chiffchaff	*Phylloscopus collybita*	70,667	40,496	100,837	Good
Goldcrest	*Regulus regulus*	58,327	37,203	79,450	Good
Firecrest	*Regulus ignicapilla*	374,023	268,205	479,841	Good
Long-tailed Tit	*Aegithalos caudatus*	142,311	103,534	181,088	Good
Crested Tit	*Parus cristatus*	218,893	174,951	262,836	Very good
Coal Tit	*Parus ater*	335,216	225,262	445,171	Very good
Blue Tit	*Parus caeruleus*	561,833	466,375	657,290	Very good
Great Tit	*Parus major*	880,665	757,356	1,003,975	Good
Nuthatch	*Sitta europaea*	10,665	6,400	14,929	Very good
Short-toed Treecreeper	*Certhia brachydactyla*	157,834	114,147	201,521	Good
Red-backed Shrike	*Lanius collurio*	31,041	18,656	43,427	Good
Southern Grey Shrike	*Lanius meridionalis*	6,167	1,141	11,193	Acceptable
Woodchat Shrike	*Lanius senator*	32,646	19,292	46,000	Good
Jay	*Garrulus glandarius*	133,417	111,232	155,601	Very good
Magpie	*Pica pica*	123,092	102,805	143,380	Very good
Carrion Crow	*Corvus corone*	9,123	5,416	12,831	Good
European Starling	*Sturnus vulgaris*	471,532	345,108	597,957	Very good
House Sparrow	*Passer domesticus*	3,229,320	2,643,851	3,814,789	Very good
Tree Sparrow	*Passer montanus*	269,406	207,865	330,947	Very good
Chaffinch	*Fringilla coelebs*	235,485	200,299	270,672	Very good
Serin	*Serinus serinus*	902,501	768,013	1,036,988	Very good
Citril Finch	*Serinus citrinella*	20,643	14,776	26,510	Good
Greenfinch	*Carduelis chloris*	220,096	183,600	256,592	Very good
Goldfinch	*Carduelis carduelis*	475,004	391,695	558,314	Very good
Linnet	*Carduelis cannabina*	159,181	114,379	203,983	Very good
Common Crossbill	*Loxia curvirostra*	20,577	13,242	27,912	Good
Bullfinch	*Pyrrhula pyrrhula*	23,219	8,885	37,554	Good
Yellowhammer	*Emberiza citrinella*	8,522	2,872	14,171	Acceptable
Cirl Bunting	*Emberiza cirlus*	244,646	201,805	287,486	Very good
Rock Bunting	*Emberiza cia*	222,330	144,808	299,853	Good
Ortolan Bunting	*Emberiza hortulana*	15,257	3,279	27,235	Acceptable
Corn Bunting	*Emberiza calandra*	252,589	186,679	318,500	Very good

odology has produced acceptable results are the Southern Grey Shrike and the Tawny Pipit, with numbers ranging from c. 1,000 to c. 10,000 breeding pairs (Table 1).

Discussion

Undertaking integrated monitoring in which the results of various schemes are brought together may be highly useful for building population models, a tool that has been used either to understand what drives population changes (*e.g.* Greenwood 1999) or for obtaining population parameters that can not be assessed using data from just one monitoring programme (*e.g.* Robertson *et al.* 1995). Each bird monitoring project focuses on one or some particular aspects of species dynamics, such as distribution, population trends, densities or demographic dynamics. It has proven to be much more efficient and realistic to maintain them as separated programmes, rather than to try to merge them in one single complex project. The challenge often arises from how to integrate such an amount of information to achieve other population parameters. Here, we have built a model that integrates data from three census schemes: the Atlas project, the common bird monitoring project (SOCC) and the Constant Effort Site project (SYLVIA). This model estimates, for the first time in most cases, accurate population sizes.

In the Atlas project volunteers were asked to make a rough population estimate at each 10x10 UTM square without doing any census, and these data were used to estimate population sizes for most breeding species by means of the methodology used in Hagemeijer & Blair (1997). It is interesting to note that here is a relatively high correlation between these estimates and those obtained by the Atlas-SOCC model (r^2=0.73, $p<0.0001$) and that the magnitude of the regression residuals becomes larger as population estimates increase (correlation between residuals and population estimates r^2= 0.41, $p<0.0001$). This is a very significant fact and may help us to appreciate the tendency towards higher estimates in some of the Atlas-SOCC models. In light of these results, it seems that our capacity for estimating the population of a 10x10 UTM square without census work is acceptable when the species is fairly abundant, whereas when the species is highly abundant, observers tend to give a maximum value which is actually less than the real figure. As an example, the atlas field estimate for the Red-legged Partridge (very similar to that obtained in the Atlas-SOCC model) is only 6 times lower than that of the Blackbird, a ratio that is hard to believe. Therefore, we believe that, when sample size and model assumptions are fitted, a procedure like the Atlas-SOCC model gives more accurate results than a non-census based estimation system.

The Atlas-SOCC population estimates can be applied to several purposes. On the one hand, they can be very useful for present and future analyses of bird conservation status at a regional level (IUCN 1996), the development of policy-relevant summary statistics (van Strien 1999) and its application in land planning (Root *et al.* 2003, Herrando *et al.* 2004). On the other hand, it is also a keystone for the integration of the results of Catalan monitoring schemes into population trends at larger scales, either at pan-Iberian, pan-Mediterranean or pan-European level. Reliable population estimates seem crucial for the correct calibration and weighting of each component, to produce an accurate total figure (van Strien *et al.* 2001). Therefore, these estimates represent an important step for the study and conservation of birds in Catalonia; however, far from being definitive, they should be revised as soon as new methodological advancements appear or SOCC coverage improves.

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Resum

El Seguiment d'Ocells Comuns a Catalunya (SOCC): una eina per estimar les seves poblacions

El SOCC és el Seguiment d'Ocells Comuns a Catalunya. Encara que l'objectiu principal del projecte és determinar les tendències de les poblacions nidi-

ficants i hivernants, la seva integració amb mapes d'alta resolució obtinguts a través de models d'adequació de l'hàbitat en el marc de l'Atles dels ocells nidificants de Catalunya ha demostrat ser una eina interessant per estimar la grandària poblacional de moltes espècies comunes per a les quals les estimacions anteriors es desconeixien completament o es basaven en pura especulació. Vam construir models de regressió (models Atles-SOCC) que relacionaven les densitats dels transectes SOCC (parelles/km^2) amb la probabilitat d'aparició (de 0 a 1) de la mostra de quadrats UTM 1x1 km en la qual aquests transectes se situaven. L'ajust del model va ser altament significatiu en molts casos, la qual cosa va permetre la projecció de la densitat de les espècies a zones no mostrejades en el SOCC però de les quals es disposava d'una probabilitat d'aparició. Els models Atles-SOCC van ser utilitzats per predir les densitats de cadascun dels quadrats UTM 1x1 km de Catalunya, i la suma de tots aquests valors va permetre obtenir la població estimada per a tot el territori. El nostre enfocament posa l'accent en l'interès de combinar resultats de diferents programes de seguiment a fi d'obtenir dades útils per establir estratègies de conservació per als ocells.

Resumen

El Seguimiento de las Aves Comunes en Cataluña (SOCC): una herramienta para estimar sus poblaciones

El SOCC (Seguiment d'Ocells Comuns a Catalunya) es el seguimiento de las aves comunes en Cataluña, un programa impulsado para cuantificar las tendencias temporales en la abundancia de aves comunes en Cataluña (NE España). Aunque el objetivo principal del SOCC es determinar las tendencias de las poblaciones nidificantes e invernantes, su integración con mapas de alta resolución obtenidos a través de modelos de adecuación del hábitat en el marco del Atlas de las Aves Nidificantes de Cataluña ha demostrado ser una herramienta interesante para estimar el tamaño poblacional de muchas especies comunes para las cuales las estimaciones anteriores se desconocían completamente o se basaban en pura especulación. Construimos modelos de regresión (modelos Atlas-SOCC) que relacionaban las densidades de los transectos SOCC (parejas/km^2) con la probabilidad de aparición (de 0 a 1) de la muestra de cuadrículas UTM 1x1 km en la que dichos transectos se situaban. El ajuste del modelo fue altamente significativo en muchos casos, lo que permitió la proyección de la densidad de las especies a zonas no muestreadas en el SOCC pero de las que se disponía de una probabilidad de aparición. Los modelos Atlas-SOCC fueron utilizados para predecir las densidades de cada uno de los cuadrados UTM 1x1 km de Cataluña, y la suma de todos estos valores permitió obtener la población estimada para todo el territorio. Nuestro enfoque hace hincapié en el interés de combinar resultados de diferentes programas de seguimiento a fin de obtener datos útiles para establecer estrategias de conservación de las aves.

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