Protocol for censusing urban sparrows

Jenny De Laet, Will J. Peach and J. Denis Summers-Smith

Abstract The Working Group on Urban Sparrows is investigating the decline of sparrows *Passer*, in urban and suburban habitats. At a meeting held in February 2009, it was decided to define a standardised census procedure that would enable meaningful comparisons of House Sparrow *P. domesticus* breeding density in urban/suburban habitats throughout this species' range. A breeding-season mapping census based on 'active' nests was proposed, together with a simplified method of describing different types of urban/suburban habitats.

Introduction

A symposium on 'The status of the House Sparrow in the urban environment', held during the 24th International Ornithological Congress in 2006, attracted considerable interest. As a result, it was decided to set up a Working Group on Urban Sparrows (WGUS) to foster the exchange of ideas among those concerned with the problem of urban sparrow population declines. The first meeting of the WGUS was held in London in February 2007, with others in Newcastle in February 2009 and March 2011.

House Sparrows *Passer domesticus* occur mainly in urban/suburban and agricultural environments. Although House Sparrow numbers have declined in both of these habitats, the farmland decline started earlier (late 1970s in the UK) and numbers have since stabilised (Robinson *et al.* 2005). The decline on farmland has been associated with reduced availability of seed and grain as a consequence of the intensification of agricultural practices (Crick *et al.* 2002). Declines in urban areas started during the late 1980s and have continued into the new millennium (Summers-Smith 2003, 2005). The pattern of population change is spatially variable, with large declines reported from some towns and cities (Dott & Brown 2000; Sanderson 2001; De Bethune 2003; De Laet 2004; Bokotey & Gorban 2005; Węgrzynowicz 2006; Summers-Smith 2009) while numbers have remained stable or increased in others (Böhner & Witt 2007). Declines in sparrow abundance have been greatest in the centres of many large towns and cities. Thus, the declines on farmland and in urban/suburban areas have occurred at different times and may have different causes.

Line-transect and point-count survey methods are both widely used for estimating bird densities. Both methods incorporate a correction for declining detectability with distance from the observer, and both assume random placement of lines/points and a near-certain probability of detecting birds at or close to the lines/points (Buckland *et al.* 2004).

Bird surveys conducted in most urban/suburban habitats are usually complicated by the need to restrict the placement of transects and points to public rights of way, which are distributed non-randomly. For example, access to potentially suitable habitat such as gardens surrounded by housing, or courtyards surrounded by flats, is often restricted. The application of distance-based methods is also complicated by the strong influence of buildings on bird detectability. For example, a House Sparrow chirping from the front of a tall building in a city-centre main street may remain audible to the observer at distances of more than 100 m along the boulevard, but rapidly becomes inaudible at much shorter distances if the observer turns into a side alley. Other factors

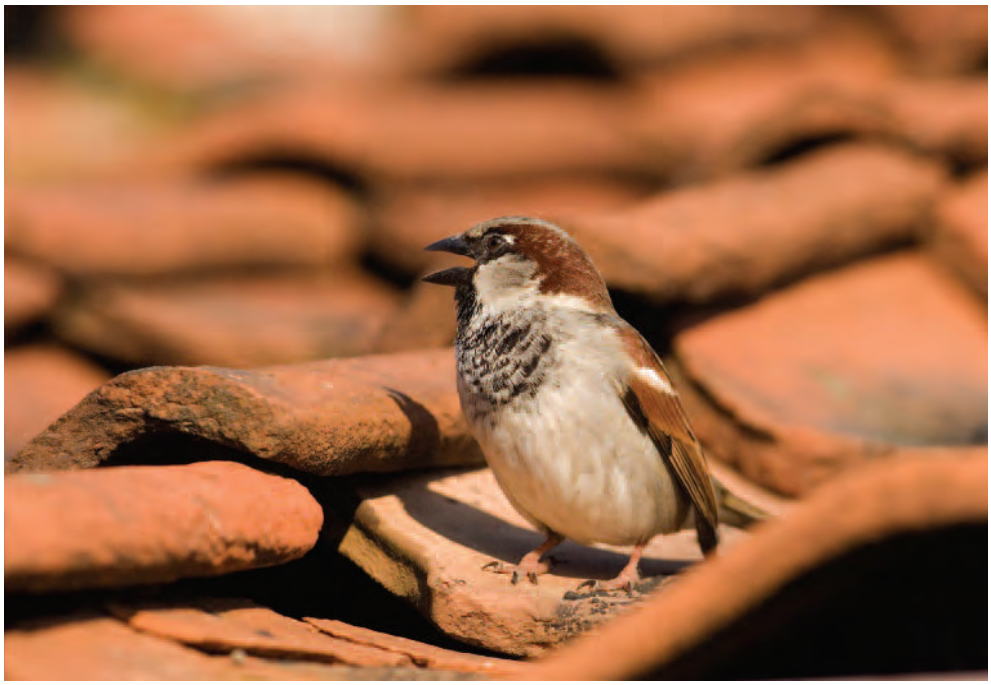
such as levels of background noise (e.g. from traffic) may limit bird detectability even at short distances from the observer.

Because the detectability of birds in urban habitats is often sensitive to factors other than distance, WGUS delegates recommended a mapping-based survey technique for censusing House Sparrows (and other sparrows, including Spanish *P. hispaniolensis* and Tree Sparrows *P. montanus*) in urban environments. A standard field methodology should aim to provide a means of conducting repeatable assessments of relative abundance that should be comparable through time and between locations. Our aim here is to propose a field method for the measurement of House Sparrow breeding density in defined areas of urban/suburban habitat. Our method should be appropriate for towns and cities as well as rural villages and smaller settlements.

The proposed methodology is based on the experience of a number of workers studying sparrows in built-up environments in a variety of countries with different urban cultures and architectures. The main emphasis is on the House Sparrow since most of our experience is with this species, but we believe that the proposed methodology should also be applicable to other sparrow species.

House Sparrow ecology

Although House Sparrows occur in farmland, the prime habitat is the built-up environment. House Sparrows are social birds that, even in a uniform environment, live and breed in loose, discrete colonies, typically consisting of 10–20 pairs, and they are extremely sedentary (Summers-Smith 1963; Summers-Smith & Thomas 2002). During the breeding season, adults provisioning young forage mainly within a 70-m radius of the nest (Mitschke *et al.* 2000). Outside the breeding season, Vangestel *et al.* (2010) found that in urban populations the core range (the OES, or outlier-exclusive core area, which quantifies the amount of habitat effectively used by individuals) of a number of radio-tracked House Sparrows increased as patches of shrubbery, hedges, and other key elements of cover became less scattered, i.e. range was greater in suburban than urban areas. Urban House Sparrows occupied significantly smaller home ranges than conspecifics from rural areas.



David Tipling

130. The presence of a chirping male at a potential nest-site is one of the key indicators of an active House Sparrow *Passer domesticus* nest.

Recommended census techniques

1. The basis of the census

The unit of the census is the 'active nest'. Active sparrow nest-sites are relatively easy to detect, either by the regular calling (or 'chirping') of the male at the site or by adult birds of either sex entering a potential nesting site with or without nesting material or food.

2. Timing

Sparrows are multi-brooded. Surveys of breeding adults should be timed to coincide with the *first* nesting attempts of the year, when breeding activity peaks and when there are no free-flying young to cause confusion. In Britain and western Europe, April and May are the best months for surveys of breeding House Sparrows. As far as possible, counts should be conducted within 2–3 hours after dawn to minimise the influence of human activity and noise. Counts should not be conducted after 12.00 hrs, when sparrow activity levels fall markedly.

3. Census area

In order to achieve meaningful and comparable estimates of sparrow breeding density, we recommend that surveys are conducted within standard-sized plots of 10–15 ha (excluding any inaccessible areas). As far as possible, these plots should be chosen at random from within larger areas of relatively uniform urban/suburban character (see section 5 for a list of key habitat description criteria). We recommend that at least two (and preferably four or more) of these 10–15-ha plots are surveyed in order to estimate local sparrow density. If extra fieldwork resources are available, it is better to survey more plots than to increase plot area. Survey plots in the same locality should be separated by a distance of at least 50 m.

It is important that survey areas are not selected using prior knowledge of House Sparrow distribution or abundance. Although it is acceptable (and sensible) to include known colonies within survey plots, the boundaries must be determined entirely by the survey-plot area constraint (above) or by relevant habitat boundaries (such as the edge of a housing estate or village).

At least four different types of urban/suburban 'habitat' need to be considered:

i. *Centres of towns and cities* are typically dominated by shops, offices and other businesses, with some residential areas. Private gardens are usually rare, although parks and other green spaces may exist.
ii. *Residential suburban areas* usually surround the centres of towns and cities and are typically dominated by flats and houses with associated gardens, parks and green spaces. As far as possible, survey areas should be selected to cover a relatively uniform area of housing character (according to house age, density and garden presence/size). In localities where at least 10 ha of uniform housing stock is not available, the observer should survey an area of mixed housing stock and quantify the housing stock composition using the criteria described below, in section 5.
iii. *Industrial areas or estates* are often located on the edges of towns and cities and are characterised by non-residential buildings and factories that usually lack gardens.
iv. *Rural villages and small towns* are usually dominated by residential housing (often of mixed age) with gardens, in addition to small numbers of shops and offices and limited green space. Farmland is often within the foraging ranges of sparrows. Rural villages are an important habitat for House Sparrows and should be censused, provided that at least 10 ha of suitable habitat is available and accessible for survey.

4. Field Survey Technique

Before any bird surveys are carried out, we recommend a detailed reconnaissance survey to map habitat, housing stock, the survey route and any inaccessible areas (Chamberlain *et al.* 2007). Housing stock should be categorised using the criteria in table 1, and areas of gardens or other green space mapped. Chirping House Sparrows usually call from perches high up on buildings or from vegetation. Owing to the effect of buildings on detectability, chirping sparrows are likely to go unheard in areas that cannot be observed directly, including many back gardens and the far side of large buildings. All inaccessible areas should be clearly marked on survey maps. It is important that surveyors do not make assumptions about

the suitability of inaccessible areas for sparrows; they must simply be defined as inaccessible and excluded from the survey area.

To detect a high proportion of first nesting attempts, we recommend that sparrows are surveyed over three visits, separated by 10–14 days. The recommended field technique is simply a whole-area search of the accessible habitat within the study area. The surveyor should walk slowly along all accessible routes and record all potential breeding activity by sparrows, including adults calling

Table 1. Key criteria influencing the potential suitability of urban/suburban areas for sparrows.

Character	Aspects to describe	Source	Example
Habitat type	Town centre, residential suburban, industrial estate, rural village	Prior knowledge, satellite map or field survey	Residential suburban
Building type	Town house/terrace, semi-detached, detached, flats/apartments, offices, shops, industrial	Satellite/high-resolution map or field survey	Mainly semi-detached houses with private gardens. Localised shops and amenity grass.
Building age	Estimate age of predominant buildings to nearest decade	Field survey	1930s
Percentage green cover	Includes all gardens, grassland, parks, trees, scrub, allotments. Estimate cover to the nearest 10%.	Combination of satellite map and field survey	40%

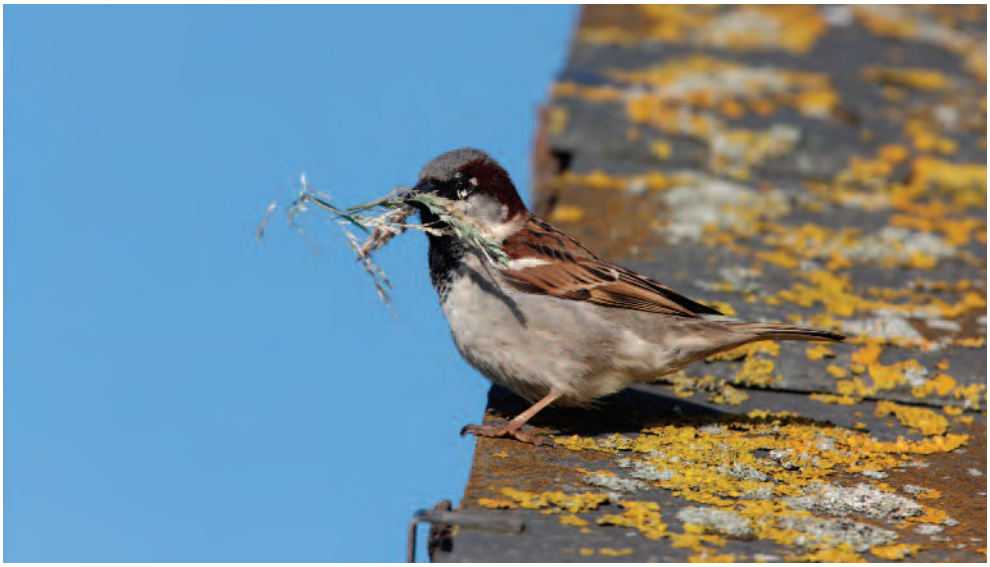
Table 2. House Sparrow breeding densities (chirping males) in Guisborough (a small town in Cleveland), 2006–08.

Habitat type (name)	Building type	Age of buildings	Survey area (ha)	Housing density (houses/ha)	Green cover (%)	Density of chirping males (individuals/ha)
Town centre	Mixture of shops, offices and residential property	Mixed	120	N/A	10%	5.1
Residential suburban	Terraced housing with open grass areas (social housing)	1950s	10	47.7	50%	9.8
Residential suburban (Rivers Estate)	Detached houses with private gardens	1950s	15	14.7	60%	1.6
Residential suburban (Pine Hills)	Detached houses with private gardens (open-plan estate)	1970s	30	14.2	60%	1.7[1]
Residential suburban (Regency Estate)	Large detached houses, private gardens	2000–02	15	13.6	30%	0
Residential suburban (Hutton Gate)	Large detached/ semi-detached houses with large mature private gardens	1950s–1970s	5	5	90%	0[2]

Notes

[1] No cavities available in houses; not colonised by sparrows until thick conifer hedges became established.

[2] In 1961–79 c. 2 individuals/ha; abandoned by sparrows in 1980.



Mike Lane

131. House Sparrows *Passer domesticus* carrying nest material into a potential breeding site is another key indicator of an active nest.

at or entering/leaving potential nest-sites and carrying nest material or food to the nest. All active nests should be mapped. We also recommend mapping all adult males seen, irrespective of their behaviour, to highlight areas of potential nesting activity during subsequent visits. The main requirement of survey maps is that the boundaries of individual buildings and gardens are clearly distinguished. Because House Sparrows sometimes nest in close proximity to neighbouring pairs, we recommend using enlarged copies of base maps, having a resolution of at least 1:2500, to record sparrows. Bird surveys should not be carried out during wet or windy (mean wind speed greater than 15 kph) weather.

An estimate of sparrow density is given by the maximum count of active nests in a plot divided by the effective study area (in ha). We recommend using maximum counts and not means because there are many reasons why active nests may not be detected on a particular day. It takes approximately two hours to cover 10–15 ha of suburban habitat.

5. Characterising urban/suburban habitats

We recommend that three key characteristics of urban/suburban sparrow survey areas should be recorded and reported in any assessments of sparrow density (table 1). The type and age of buildings will directly influence the availability of nesting sites, while the age of gardens and extent of green space will influence the quality and quantity of foraging habitat and cover.

Examples of the information needed to assess and compare sparrow densities across study areas are provided in table 2.

Discussion

There are various alternative techniques for determining bird population density (Bibby *et al.* 1992; Gregory *et al.* 2002) but, for a species like the House Sparrow, for which active nests are relatively easily located, a mapping census gives a direct estimate of breeding population density. Line-transect and point-count methods require restrictive assumptions about random placement of lines and points and about high bird-detection rates close to the observer (Buckland *et al.* 2004). Both of these assumptions may be seriously compromised in an urban setting. There may also have been long-term changes in detectability linked to changes in background noise levels or predator abundance (for example, House Sparrow behaviour may have become more cryptic since the colonisation of urban areas by Eurasian Sparrowhawks *Accipiter nisus*; JDSS pers. obs.). As a consequence of these concerns about small-scale and temporal variation in House Sparrow detectability in built-up areas, we

advocate a mapping-based field method.

To obtain a useful measure of population size, surveys need to be carried out during the breeding season, when sparrows are tied to specific areas. Many standard methods for surveying bird abundance are not ideal for sparrows in urban areas. The survey area is often rather large and field methods not well suited to a colonial nester in a highly heterogeneous environment where detectability varies markedly. Furthermore, the timing of later visits (as in many monitoring schemes) also risks incorrectly recording young House Sparrows as adults. Our recommended approach is to focus on a survey area small enough for each visit to be comfortably undertaken in a single morning and for the survey to be limited to the period before any first-brood young fledge. We acknowledge, however, that because our proposed methodology is tailored specifically towards sparrows in urban/suburban areas, it may not be suitable for extensive, multi-species monitoring programmes.

There is an urgent need for a standardised field protocol for determining sparrow densities and population size in urban/suburban environments. We hope that our proposed methodology will provide a basis for determining breeding status and distribution, monitoring trends in abundance through time and comparing densities in urban/suburban localities throughout the world.

References

Bibby, C. J., Burgess, N. D., & Hill, D. A. 1992. *Bird Census Techniques*. Academic Press, London.

Böhner, J., & Witt, K. 2007. Distribution, abundance and dynamics of the House Sparrow *Passer domesticus* in Berlin. *Intern. Stud. Sparrows* 32: 15–33.

Bokotey, A., & Gorban, I. M. 2005. Numbers, distribution and ecology of the House Sparrow in Lvov (Ukraine). *Intern. Stud. Sparrows* 30: 7–22.

Buckland, S. D., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., & Thomas, L. 2004. *Advanced Distance Sampling: estimating abundance of biological populations*. OUP, New York.

Chamberlain, D. E., Toms, M. P., Cleary-Mcharg, R., & Banks, A. N. 2007. House Sparrow (*Passer domesticus*) habitat use in urbanized landscapes. *J. Orn.* 148: 453–462.

Crick, H. Q. P., Robinson, R. A., Appleton, G. F., Clark, N. A., & Rickard, A. D. 2002. *Investigation into the Causes of the Decline of Starlings and House Sparrows in Great Britain*. BTO Research Report No. 290, Thetford.

De Bethune, G. 2003. Die stille lente: Vijftig jaar evolutie van de broedvogels in een kilometerhok bij Kortrijk. *Natuur Oriolus* 70: 153–158.

De Laet, J. 2004. De Huismus: verontrustend nieuws, in de steden is het niet vijf maar Twee voor twaalf. *Mens en Vogel* 42: 238–245.

Dott, H. E. M., & Brown, A. W. 2000. A major decline of House Sparrows in central Edinburgh. *Scott. Birds* 21: 61–68.

Gregory, R. D., Gibbons, D. W., & Donald, P. F. 2002. Bird census and survey techniques. In: Sutherland, W. J., Newton, I., & Green, R. E. (eds.), *Bird Ecology and Conservation: a handbook of techniques*. OUP, Oxford.

Mitschke, A., Rathje, H., & Baumung, S. 2000. House Sparrows in Hamburg: population habitat choice and threats. *Hamburger avifaun. Beitr.* 30; 129–204.

Robinson, R. A., Siriwardena, G. M., & Crick, H. Q. P. 2005. Size and trends of the House Sparrow *Passer domesticus* population in Great Britain. *Ibis* 147: 552–562.

Sanderson, R. 2001. Further declines in an urban population of House Sparrows. *Brit. Birds* 94: 507.

Summers-Smith, J. D. 1963. *The House Sparrow*. Collins, London.

— 2003. The decline of the House Sparrow: a review. *Brit. Birds* 96: 439–446.

— 2005. Changes in the House Sparrow population in Britain. *Intern. Stud. Sparrows* 30: 23–47.

— 2009. Densities of House Sparrows in different habitats in a small town in NE England. *J. Yamashina Inst. Ornithol.* 40: 117–124.

— & Thomas, D. K. 2002. House Sparrow. In: Wernham, C. V., Toms, M. P., Marchant, J. H., Clark, J. A., Siriwardena, G. M., & Baillie, S. R. (eds), *The Migration Atlas: movements of the birds of Britain and Ireland*; 633–634. Poyser, London.

Vangestel, C., Braekman, B. P., Mateve, H., & Lens, L. 2010. Constraints on home range behaviour affect nutritional condition in urban House Sparrows (*Passer domesticus*). *Biol. J. Linn. Soc.* 101: 41–50.

Węgrzynowicz, A. 2006. Changes in the numbers of the House and Tree Sparrow in Warsaw, Poland, during 1971–2006. *Intern. Stud. Sparrows* 31: 13–26.

Jenny De Laet, ABLLO vzw/UGent, Ledeganckstraat 35, B-9000 Ghent, Belgium; e-mail jenny.delaet@ugent.be

Will J. Peach, RSPB, The Lodge, Sandy, Bedfordshire SG19 2DL; e-mail will.peach@rspb.org.uk

J. Denis Summers-Smith, 79 Thames Avenue, Guisborough TS14 8AJ; e-mail jdss1@sky.com

Jenny De Laet is part-time policy officer of the nature and environment organisation ABLLO vzw (Belgium), specialising in sustainable urban development, and visiting researcher at the group TEREC of UGent. **Will Peach** is Head of Research Delivery at the RSPB, where he leads a team developing and testing conservation solutions for farmland birds. **Denis Summers-Smith** is a member of the Working Group on Urban Sparrows (WGUS). He is a retired mechanical engineer who has been studying the genus *Passer* for over 60 years.