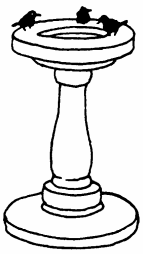
Wild bird care in the garden

A scientific look at large scale, do-it-yourself, wildlife management

UFAW International Animal Welfare Symposium
Zoological Society of London, London UK, 4th May 2010



Talks

INTRODUCTION: THE GARDEN BIRD HEALTH INITIATIVE

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It used to be that animals were either kept, and therefore our responsibility, or wild, and not. But now it is not so simple. Because of the size of the human population and the extent to which we use or control the environment, we greatly, and often directly, influence the welfare and fates of very many wild animals. This has brought increasing responsibility for them. Human/garden bird interactions are one of the front lines in the development of this new relationship with wildlife. Having taken over a large proportion of the land for housing, industry and farming, providing food for wild birds is one way of helping to redress the balance. There has been a huge growth of interest in feeding garden birds in many countries and, in the UK, amounts provided are at levels that could make a significant contribution to the annual food requirements of some populations. However, this then raises questions about what, and how best, to feed in order to maximise benefits and minimise risks that can accompany provisioning of animals.

To start to consider these matters, UFAW organised a workshop in 2003 on feeding garden birds to, amongst other things, '*review the possible benefits and disadvantages to birds and to consider if there is a need for improvements in current practices*.' That led to the formation of the Garden Bird Health Initiative the aims of which were to: (i) develop and publish guidelines about how to best feed garden birds in order to maximize the benefits for their welfare and conservation and (ii) to undertake a major garden bird health surveillance and research project. Thanks to very generous financial and other support and good will from all the individuals and organisations involved it has been possible to pursue these ambitions over the years since then (as illustrated by some of the presentations at this Symposium). The garden bird health surveillance and research project has been an excellent collaboration, involving not just academic, industry and other organisations but also the thousands of members of the public who have been the eyes and ears of the surveillance throughout the UK.

As anthropogenic pressures on the environment grow, what used to be 'the wild' is increasingly managed for wildlife. Studies of garden bird feeding and habitat management are important to inform the best methods for these and may be relevant to wildlife management in other contexts also.

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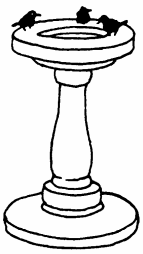

THE HISTORY OF GARDEN BIRD FEEDING

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Caring for the birds is an enthusiasm that can be dated back to St Cuthbert in the 7th century AD who established what in effect was the world's first bird reserve on Inner Farne, off the coast of Northumbria.

There are lots of subsequent accounts of people who looked after birds for their meat, or managed estates to increase wild bird numbers, but it wasn't until 1825 that the Shropshire ornithologist John Freeman Dovaston described his 'ornithotrophe' at which he had attracted 23 species of bird during the winter of 1825. Essentially a cattle feeder made of wood and modified with perches and filled with scraps, Dovaston's first experiments in the creation of bird feeders happened 162 years before the creation of Britain's first specialist wild bird feeding company just eighteen miles away.

In the 1880s Baron von Berlepsch developed winter feeding stations on 500 acres of his ancestral estate in central Germany, using fat mixtures, tubular hanging feeders and large covered bird tables or "bird houses".

The winter of 1890 was unusually severe and seems to mark the start of wide-scale bird feeding in Britain. By 1908 the interest was such that Witherby & Co. published the first English edition of the German title *How to Attract and Protect Wild Birds*. Two years later *Punch* magazine described bird feeding as a national pastime, with companies offering equipment by mail order.

A few years after the Great War the coconut tit-bell was first popularised on the BBC radio programme *Children's Hour*.

By the late 1950s there were reports of Great Spotted Woodpeckers coming to small, suet-filled logs, perhaps the first addition to the list of species that can be attracted with supplementary food. In 1965 the first edition of *The Bird Table Book* by Tony Soper was published, and, in revised forms, is still in print today.

Between 1968 and1972 there were increasing reports of Siskins coming to garden to feed on red net bags filled with peanuts and in 1969 Peter Kilham of Droll Yankees Inc introduced the first of the modern polycarbonate and metal tubular feeders.

In 1987 CJ WildBird Foods Ltd, Europe's first specialist wild bird food company, was founded, and over the next few years introduced as wild bird foods many of the ingredients that are now regarded as commonplace, including peanut granules, "nil detectable aflatoxin" peanuts, black sunflower seeds, sunflower hearts and mealworms.

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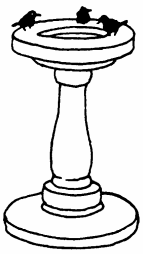

FEEDING WILD BIRDS: WHY WE NEED TO KNOW MORE ABOUT A GLOBAL EXPERIMENT

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The feeding of wild birds in gardens is one of the most widespread and common forms of human-wildlife interactions in the Western World. Starting primarily as a limited humane outreach to wintering birds, it is now a year-round activity engaging millions of people in daily intimate contact with wild animals. For many people, especially those living in large urban centres, this practice is enjoyable, educational and inspiring. For uncountable numbers of birds, the practice is of critical importance for survival. Nonetheless, despite the ubiquity of wild bird feeding in many countries, remarkably little is known with certainty about the ecological and behavioural implications of the practice. This is important because many feeders – as well as an increasingly vocal number of critics – are concerned about issues such as the nutritional adequacy of the foods being provided, the possible spread of disease, and most significantly, the possibility of birds becoming dependant on anthropogenic foods. These are significant concerns and my research indicates that they are taken serious by most feeders. Furthermore, feeders themselves provide an irreplaceable opportunity for large-scale surveillance of the health and activities of the birds visiting their house yards. Such monitoring has already yielded invaluable insights into the spread of diseases, preferences for seed and other food types, as certain behaviours. Harnessing the enthusiasm and ethical concern of the vast numbers of people engaged in feeding wild birds is likely to be the best approach to finding answers to critical questions.

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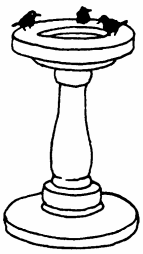

TRACKING INDIVIDUAL VARIATION IN THE UPTAKE OF FOOD SUPPLEMENTS BY WILD BIRDS USING STABLE ISOTOPES

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Supplementary feeding by householders represents a huge intervention into the ecology of wild birds populations, yet we are only just beginning to appreciate the types of impact that it may have. Recently it has been shown that large scale feeding during winter months can influence both lay date and reproductive success in the subsequent breeding season, but these patterns are not consistent among years. This pattern could be linked to variation in "natural" food availability swamping the benefit of supplements, but it is also important to recognise that access to feeders can be controlled by despotic individuals. As such population level measures may mask some of the potential patterns associated with supplementary feeding and measures such as depletion rates of feeders may not reflect uptake of supplement at the population level. Here we show how we can track individual variation in the use of supplements within and among woodlands using stable isotopes. We show how these data can be used to calculate actual uptake of supplements by individual birds and, more importantly, how individual level effects of supplement uptake can be revealed where population-level measures find no apparent effect.

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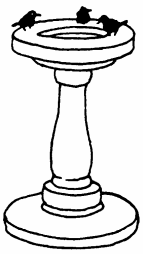

EFFECTS OF FOOD SUPPLEMENTATION IN SPRING AND EARLY SUMMER ON AVIAN BREEDING PERFORMANCE

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It is estimated that approximately £144 million and £72 million are spent annually on supplementary food in the UK and in mainland Europe, respectively. The comparable figure for the USA is £2.3 billion that represents 450,000 metric tonnes of seed provisioned per year. Such food supplementation by the general public is encouraged partly by advice from organisations (e.g. the British Trust for Ornithology [BTO]) and partly by the popular science media (e.g. the BBC's *Springwatch*) that promote year-round feeding. Today, food supplementation of birds is widespread in gardens and it takes place increasingly over the spring and summer partly in response to such advice. However, do we have empirical evidence to substantiate the adoption of such feeding patterns? We attempted to mimic the feeding of birds in gardens by providing two different commercially available food supplements (i.e. peanut cake and mealworms *Tenebrio molitor*) over the spring and early summer to breeding Blue Tits *Cyanistes caeruleus* and Great Tits *Parus major* in a central England woodland from 2006 to 2008, inclusive. Food supplementation significantly advanced laying but, surprisingly, reduced fledging success in both species. However, providing mealworms, as well as peanut cake, resulted in enhanced apparent survival of fledglings as estimated from mist-netting in the woodland in October and November of the study years. Stable isotope analysis (SIA) was used to investigate the extent of reliance of birds on food supplements and it revealed that both mealworms and peanut cake constituted minor fractions of avian diet during the study period. We remain intrigued how minor dietary contributions of food supplements translate into such marked reproductive effects. We will examine the significance of our findings in the broader context of other ongoing studies in the woodland. In future we will investigate the motivations of the UK general public that have resulted in the adoption of food supplementation as a 'good thing'. In light of our findings, we believe that there is much still to learn about the effects of extensive and protracted food supplementation on the breeding biology of birds. However, further research will inevitably lead to more informed food supplementation that remains one of the most potent conservation tools. It continues to promise much in recovery programmes of some of the world's most endangered species (e.g. Kakapo *Strigops habroptila*).

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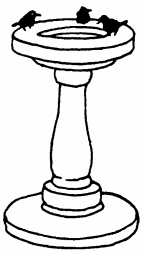

THE EFFECTS OF SUPPLEMENTARY FEEDING ON PRODUCTIVITY AND POPULATION SIZE OF URBAN HOUSE SPARROWS *PASSER DOMESTICUS* – EVIDENCE FROM A REPLICATED FIELD EXPERIMENT ACROSS LONDON

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In recent years, urban house sparrow populations have suffered rapid steep declines in many of European cities. For example, in London, there was a 60% decline in abundance between 1994 and 2004. Earlier declines on farmland have been attributed to a lack of food during winter linked to changes in agricultural practices. The decline in towns and cities started later than on farmland and may, therefore, have different causes. Due to a paucity of empirical evidence, there has been much speculation concerning possible environmental causes of sparrow declines including increased predation and pollution and losses of nest sites. Recent studies have highlighted a lack of invertebrate prey for nestlings as a factor limiting reproductive success and possibly population size. Here we report on a supplementary feeding experiment that tests this hypothesis. We studied 66 house sparrow colonies across Greater London between 2005 and 2009. At half of these colonies we provided mealworms twice each day throughout the breeding season, while the other half served as unfed controls. In addition, from May 2007, each experimental (fed) site was provided with a constant, year-round supply of sunflower hearts to test whether poor post-fledging survival might be limiting population recovery. Generalised linear mixed models were used to assess the effect of the feeding treatment on reproductive success (juvenile abundance) and population change (adult abundance). Results indicate consistently higher productivity on fed sites in all years, but no overall impact on adult abundance. However, mealworm feeding did lead to increases in adult population sizes at smaller colonies, and there was some evidence that providing mealworms plus year-round seed increased adult abundance at medium-sized colonies. The impact of mealworm feeding on productivity was smaller (and not statistically significant) at larger colonies suggesting that the scale of supplementary invertebrate provision may have been inadequate at larger colonies. We conclude that the availability of invertebrate prey limits house sparrow reproductive success in urban-suburban Greater London, and may limit population size. The limited impacts of our feeding on larger colonies suggest that food provision may have been inadequate at those sites (all colonies were provided with the same amount of food irrespective of their size). We briefly consider other environmental correlates of population trend across our sample of London sparrow colonies.

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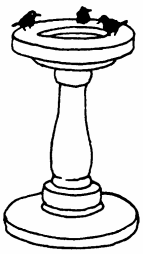

MONITORING BREEDING SUCCESS OF URBAN BIRDS: THE BTO'S NEST BOX CHALLENGE

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As the countryside is developed, so gardens are becoming an increasingly important resource for many of the UK's bird species, and the avian populations inhabiting them are providing a key opportunity for people living in built up areas to engage with wildlife. While species such as tits, Starlings and House Sparrows inhabit a wide range of rural, urban and suburban habitats, relatively little is known about the way in which associated factors such as climatic amelioration, supplementary feeding and non-native species impact on their breeding success and survival at a national scale. In 2007, the British Trust for Ornithology (BTO) under joint funding by the BBC, launched the BTO Nest Box Challenge (NBC). NBC is designed to collect breeding information for a range of cavity-nesting species inhabiting boxes in rural, suburban and urban gardens. Information is gathered on an annual basis using a web-based recording scheme that would appeal to volunteers who had not taken part in national bird surveys before.

Now in its third year, NBC currently receives information about the contents of c. 5000 boxes per annum, allowing calculation of box occupancy rates, laying dates and clutch and brood sizes. These parameters can then be related to characteristics of both the boxes themselves and the gardens in which they are located, details of which are also recorded by participants. Regional variation in breeding success and the influence of urbanisation at larger spatial scales can also be assessed in combined analyses that also incorporate BTO Nest Record Scheme data collected across a broader range of habitats.

Preliminary analyses have identified a number of trends consistent with those based on more intensive monitoring systems in the published literature, including an advance in laying with increasing urbanisation and delayed laying at higher latitudes, as well as a number of significant relationships with local scale habitat variables and box characteristics. NBC has successfully provided a framework by which the breeding success of urban birds can be monitored by members of the public. Now the system is established, we can begin to develop the functionality in order to answer more specific questions relating to the impacts of factors such as nest box design, planting of non-native species, supplementary feeding regimes and the presence of urban predators on productivity at a national scale.

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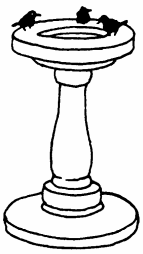

PROVISION OF SUPPLEMENTARY FOOD AT GARDEN FEEDING STATIONS AND ITS VALUE TO WILD BIRDS IN BRITAIN AND IRELAND

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Private gardens make a significant contribution to the habitat available to wild birds within Britain and Ireland and may be used by birds for both the feeding and nesting opportunities they provide. Garden use shows a clear seasonal pattern which, for most species, involves a greater use of garden feeding stations during the winter months. Since birds are one of the more mobile taxa, seasonality in the use of garden-based resources is likely to reflect a response to wider processes, suggesting that gardens should not be viewed in isolation.

The provision of supplementary food by householders is a widespread practice within Britain and Ireland (though this is not necessarily the case elsewhere in the world) and it has been shown that the presence of this resource may influence the use of gardens by wild birds. Using information collected through a series of 'citizen science' studies we examine both seasonal and longer term patterns in food provision, highlighting, for example, variation in the range and quantity of food provided between individual households. In addition, we present information on how the exploitation of the food resource by particular bird species may vary in relation to food availability within the wider landscape.

The use of data collected through national schemes, such as the BTO Garden BirdWatch, has the potential to place the importance of supplementary feeding within gardens into a wider context. The fact that this garden resource is used by bird populations from across a wider geographic area suggests that the value of supplementary feeding to wild birds within Britain and Ireland may have far reaching benefits.

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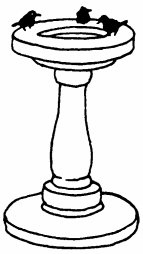

MYCOPLASMAL CONJUNCTIVITIS IN HOUSE FINCHES: HOST AND DISEASE DYNAMICS IN THE INTRODUCED AND NATIVE RANGE OF THE HOST

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In 1994 a new disease appeared in house finches *Carpodacus mexicanus.* It was caused by a novel strain of the bacterial pathogen *Mycoplasma gallisepticum (MG)* which had until than only been known from poultry. In house finches the pathogen causes severe conjunctivitis. The epidemic spread rapidly in the eastern (introduced) part of the finch's range where it caused massive declines in host abundance. In 2002 it successfully spread to the western (native) range of the host where it spread much more slowly.

To understand and model the dynamics of *Mycoplasma gallisepticum* in house finches we combine data from three lines of investigation: volunteers report observations of diseased and healthy finches which allows us to describe disease prevalence at large geographic scales; intense capture-mark-recapture studies in local populations makes it possible determine effects of disease on survival and behavior; and controlled experimental infections in captivity let us understand factors influencing the course of the disease in individuals and groups in controlled conditions.

As *Mycoplasma gallisepticum* spread we have been collecting *MG* isolates regularly. This showed rapid changes in the pathogen. In western (native) populations the effect of *MG* on house finches is much less severe than in eastern (introduced) populations. To test if this was caused by the larger genetic variation in native house finches than in the introduced ones, or was caused by a reduction in virulence as the pathogen spread West we performed a common garden experiment exposing eastern and western birds to eastern and western *MG.* The current results show that, surprisingly, eastern and western birds respond similarly to *MG* infections, implying that the pathogen underwent evolutionary changes as it expanded.

Recently we have started exploring how widespread *MG* is in other bird species. *MG* can be isolated in various other bird species, although usually it does not cause clinical disease in those. We have therefore started experiments to test the response of various passerines to *MG* inoculation, and to test the competence of these species as reservoirs. Our current results suggest that at least American goldfinch and northern cardinal could play an as yet underestimated role in mycoplasmal conjunctivitis dynamics in house finches.

The research is supported by NSF grants under the Ecology of Infectious Diseases program to a multi-disciplinary team.

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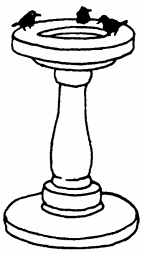

FACTORS ASSOCIATED WITH RISK OF INFECTIOUS DISEASE AT GARDEN FEEDING STATIONS

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Although supplementary feeding can have beneficial effects for garden birds, such as increased overwinter survival and enhanced breeding success, feeding wild birds may also have negative impacts, including the potential for increased exposure to pathogens at feeding sites. As part of the Garden Bird Health initiative the BTO organised a systematic survey asking volunteers to record numbers of birds visiting their gardens, as well as information relating to quantity and types of food and feeders provided each week, and basic hygiene measures. Volunteers sent any birds found dead in their gardens to disease investigation centres for post mortem examination to identify the cause of death. We used this information to assess which factors were associated with incidence of disease at garden feeding stations. Of the 758 gardens from which data were collected 77 (10.2%) had cases of disease, most of which were identified as avian trichomonosis. Several factors were associated with increased disease incidence, particularly the provision of large quantities of food. Here we present the preliminary findings from this study and discuss the implications for food provisioning, with recommendations for future study priorities.

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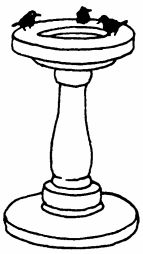

A PILOT STUDY TO DETERMINE EPIDEMIOLOGICAL FACTORS ASSOCIATED WITH THE EMERGENCE OF TRICHOMONOSIS IN WILD FINCH POPULATIONS OF THE CANADIAN MARITIME PROVINCES

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In the summer and fall 2007, trichomonosis emerged as a disease affecting wild purple finch (*Carpodacus purpureus*) and American goldfinch (*Carduelis tristis*) populations in the Canadian Maritime provinces. Since that time, trichomonosis mortality has been observed in these species at public bird feeding and watering stations throughout the region. In an attempt to better understand the epidemiology of trichomonosis in the affected finches and the potential role of bird feeding and watering practices in the transmission of the disease, a pilot study was completed in the summer of 2009. The five objectives of the study were:

1) Encourage public submission of birds found dead at feeding and watering stations throughout the region to the Canadian Cooperative Wildlife Health Centre (CCWHC) for complete necropsy to determine cause of death.
2) At three properties where trichomonosis mortality was confirmed by positive necropsy results, mist net or live trap all bird species utilizing feeding and watering stations and swab separately their oropharynx and cloaca for *Trichomonas* sp. culture using the In Pouch™TV technique.
3) At the same three properties noted above, swab all feeding and watering stations for *Trichomonas* sp. culture using the In Pouch™TV technique.
4) Identify with PCR and sequence any *Trichomonas* isolated from birds, bird feeders and watering stations.
5) Engage the general public in scanning surveillance for mortality at bird feeding and watering stations throughout the Canadian Maritime provinces by inviting them to participate in a questionaire specifically designed to address the potential roles of feeding and watering birds in the transmission and maintenance of trichomonosis in the environment.

A review of the study's results will be the focus of this presentation.

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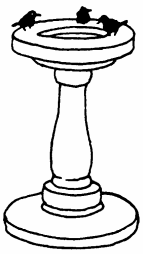

SALMONELLOSIS IN GARDEN BIRDS IN SCOTLAND – A CHANGING PICTURE

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Salmonellosis has been recognised as being a cause of mortality in garden birds in Great Britain since the early 1960s. Mortality most often occurs in finches, sparrows and dunnocks, although other species/groups can be affected. Since 1995 Ayr Disease Surveillance Centre of SAC Consulting Veterinary Services has examined over 900 finch/sparrow/dunnock carcases and diagnosed salmonellosis in over 300 of these birds. A diagnosis of salmonellosis was made if a heavy growth of *Salmonella* Typhimurium was isolated from at least one organ/tissue on direct culture. An incident of salmonellosis was defined as the first and subsequent direct isolation(s) of a particular phage type of *S.* Typhimurium from garden bird(s) on a single site within a *Salmonella* seasonal year. The seasonal year was taken to run from September to August rather than January to December because of the seasonal nature of salmonellosis.

During the fifteen years of this ongoing study changes in the pattern of salmonellosis have been noted. Since year 11 of the study (September 2005/August 2006) there has been a fall in the number of finch/sparrow/dunnock carcases in which salmonellosis was diagnosed, and a reduction in the number of salmonellosis incidents. There has also been a steady fall since year 9 in the percentage of finches/sparrows/dunnocks submitted in which salmonellosis was the cause of death. The results for the current year (year 15) are awaited.

The percentage of salmonellosis carcases that were greenfinches has also dramatically fallen during the period of study. In the north of Scotland greenfinches initially comprised 70-100% of all birds with salmonellosis. As the study progressed and salmonellosis was seen in other species, the percentage of birds with salmonellosis that were greenfinches fell to around 40%, before falling even further in years 14 and 15 (incomplete data).A similar picture has emerged in the south of Scotland, although greenfinches were never as dominant a species here. The percentage initially rose to around 50%, but since year 11 has substantially decreased. It is unclear if this reduction in the greenfinch percentage represents developing resistance by the greenfinch population to the effects of *Salmonella*, increased spread to other species, a reduction in the greenfinch population due to another infectious disease (trichomonosis), or a combination of all factors.

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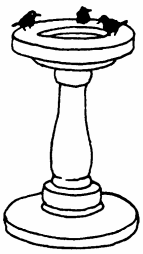

FEEDER COLOUR: A TOOL FOR REDUCING COMPETITION AT GARDEN FEEDERS?

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Birds assort themselves within feeding sites in order of dominance and foraging site quality both within and between species. Therefore, in gardens feeders are often monopolised by dominant birds thus reducing the species and demographic diversity supported. Here, we investigate between and within-species differences in responses to changes in feeder colouration. At a population level, rural blue tits *Cyanistes caeruleus* were biased toward blue, and both rural and urban great tits *Parus major* and coal tits *Parus ater* against blue and yellow feeders. Next, we used electronic tags to analyse individual foraging behaviour and social interactions. All birds appeared to prefer blue or green, but used red and yellow when competitively excluded or these non-preferred colours occurred on feeders in preferred foraging positions. Neophobic responses to changes in feeder colour depended on age, sex and species but there was evidence that subordinates (juveniles/females/smaller species) took greater risks in approaching novel coloured feeders than dominants. Thus, population level responses to feeder colour, or indeed position, may not truly reflect the biases of the individual. Moreover, individuals may differ in their propensity or ability to express foraging biases. Our data suggest that subordinate birds/species could be encouraged and diversity increased in gardens by regularly changing feeder colour. This may increase perceived variation in 'feeder quality' without actually penalising users of 'low quality' aversive colours.

Wild bird care in the garden

A scientific look at large scale, do-it-yourself, wildlife management

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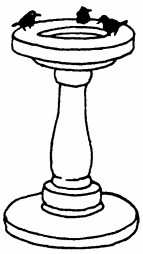

Posters

THE USE OF GARDENS FOR BIRDWATCHING BY BIRDWATCHERS

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This study is part of a wider study that attempts to explore the understanding of locational choices and place meanings for birdwatching. This study employs a qualitative methodology and focuses deliberately on exploring individual points of view by capturing the perspectives of birdwatchers in order to secure rich descriptions of places and birdwatching.

Semi-structured interviews of 32 birdwatchers were held. Participants were selected using the author's personal contacts drawn from over 20 years' experience as a birdwatcher in the study area; from direct appeal to members of three local birdwatching societies and using a 'snowball' technique using one contact to help recruit another contact.

Although gardens are frequently used locations for birdwatching, the study reveals they are often a subconscious location and resource for birdwatching activity and some keen birdwatchers took little notice of the birds in their gardens or acquired properties that were unsuitable for garden birdwatching. It had been anticipated that gardens would form part of the process of residential selection and that 'Gardening for birds' would be important for birdwatchers, but this often does not appear to be the case.

The study explores how birdwatchers use their gardens for birdwatching, the extent of providing resources for birds, including provision of food, water, nest materials and nest sites and the extent to which birdwatchers alter their gardens. Gardens of all sizes were regarded as personal, private spaces with the owners being arbiters of access and alteration and the study explores attitudes to place, feelings of ownership and attachment.

From analysis of the data, a number of conclusions are drawn about gardens as birdwatching sites in terms of the importance of a garden for birdwatching; the extent of altering gardens for birdwatching; the motivations for 'providing for the birds'; the relationship between manipulating gardens and the 'wildness' of the birds; and feelings of territoriality and attachment to the birds in their gardens.

The results suggest that although gardens are widely recognised as human influenced sites with the potential for human-avian interaction, neither the degree of the potential of gardens for birdwatching nor the potential of gardens for supporting bird populations is consciously recognised by most birdwatchers.

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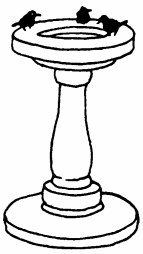

COUNTING THE COST OF CATS – A REVIEW OF CAT RELATED CASUALTIES ADMITTED TO RSPCA WILDLIFE CENTRES

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There are estimated to be 8 million domestic cats and over 800,000 feral cats in the UK, with one study estimating a population density of 229 cats/km^2 in one urban area in England. The impact of these cats on native wildlife has been the subject of a number of studies and conservationists are concerned that cats are partly responsible for local declines of some species of bird of conservation interest.

The RSPCA operates four Wildlife Centres in England that take in a wide variety of wild animal casualties for a variety of different reasons. Each animal is assessed on admission and a reason for admission is recorded. We can use this data to quantify the numbers of casualties that are caused by cats and report on their outcome.

72,000 animals were admitted between 1/1/2005 and 31/12/2009. Nearly 10% of these had been attacked by another animal with 58% being identified as victims of cats. This poster discusses this data in detail, and suggests that consideration needs to be given to the consequences of attracting birds into areas with a high predator density.

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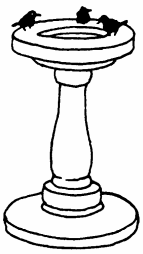

FOOD SUPPLEMENTATION AND NEST SIZE IN THE BLUE TIT, *CYANISTES CAERULEUS*

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The widespread provision of supplementary food for garden birds by millions of householders has had many positive, yet occasionally negative, consequences for avian ecological and evolutionary processes. Food is generally supplied during the winter months and then ceases as spring progresses, when it is assumed that the birds can 'look after themselves' as natural food supplies become more abundant. Nevertheless, whilst supplemental food has been shown to increase reproductive success in terms of lay date, fecundity, hatching success, nestling growth and fledging success, the potential influence on nest characteristics has been overlooked. This is surprising as first, nest construction is widespread amongst birds and is an energetically expensive and time-consuming activity, second, nests are extended phenotypes of the builder/s and should vary with the builder/s condition and third, intra-specific variation in nest characteristics have important consequences for fitness. Therefore, in this study, we aimed to experimentally examine the influence of food availability on nest characteristics in a common garden bird, the blue tit, *Cyanistes caeruleus*. We provided supplementary food to experimental pairs during the nest-building period and in comparison with control females that did not receive supplementary food, experimental females constructed heavier nests, with greater amounts of moss base but similar amounts of cup lining, despite there being no differences in the time taken to build the nest. Therefore, the supplemental feeding of wild birds during early spring, in a manner mimicking householders provisioning in gardens, influences nest characteristics. With levels of bird feeding by householders continuing to increase, further studies could usefully examine the effects of such additional food on the nest characteristics of other garden birds and examine the consequences of altered nest characteristics for fitness.

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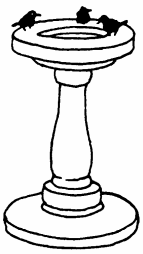

WILD BIRD STRAINS OF *SALMONELLA ENTERICA* SEROVAR TYPHIMURIUM IN GARDEN BIRDS, CATS AND HUMANS

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Wild bird strains of *Salmonella enterica* serovar Typhimurium, including phage types DT40, DT56 and DT56variant (DT56v), have been associated with disease in wild finches (Family *Fringillidae*), cats and humans in the UK. Outbreaks of salmonellosis occur in wild finches congregating around feeding tables in gardens in the cooler months of the year. This study investigated the potential role of garden birds as a source of *Salmonella* spp. infection for cats and humans.

Wild bird strains of *S.* Typhimurium were isolated from faecal or intestinal samples submitted to the University of Glasgow Veterinary School from 16 cats in Scotland and Northern England from 1975 to 2009. Ten isolates were made in the winter months (December to February). Four isolates were phage type DT56, five were DT40 and seven were DT56v. In 11 cats for which information was available, all had a history of hunting garden birds. Of 14 cats with clinical disease, 13 recovered after antibiotic treatment and one died. Two cats excreted *S.* Typhimurium DT40 in their faeces without developing clinical disease. These two cats had caught and/or eaten confirmed infected goldfinches (*Carduelis carduelis*), siskins (*Carduelis spinus*), greenfinches (*Carduelis chloris*) and chaffinches (*Fringilla coelebs*) in a garden in Scotland in January and February 2009. Contamination with *S.* Typhimurium DT40 was identified on the ground under bird feeders in the garden. Among isolates of *S.* Typhimurium from humans with enteric salmonellosis that were typed at the Scottish Salmonella Reference Laboratory from 2001 to 2007, 47 were DT40 and 29 were DT56v; 18 (38%) DT40 and 15 (52%) DT56v isolates were from children under 5 years of age.

Cats and humans can develop enteric disease following infection with wild bird strains of *S.* Typhimurium and cats may also excrete *S.* Typhimurium DT40 without evidence of clinical disease. Cats are most likely to be infected with wild bird strains of *S.* Typhimurium by catching and eating infected garden birds. Garden birds with clinical disease due to *S.* Typhimurium are more likely to be caught and eaten by cats around feeding stations than healthy birds. This has implications for assessing the impact of cats on garden bird populations through predation. Cats and the garden environment are potential sources of infection for humans. Humans, particularly children, may be exposed to wild bird strains of *S.* Typhimurium through the hunting activities of their cats or by contact with the environment around bird feeding stations in gardens.