Urban Biodiversity: Successes and Challenges: The Biodiversity in Glasgow (BIG) project: the value of volunteer participation in promoting and conserving urban biodiversity.

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INTRODUCTION

Glasgow is an ideal city in which to look at urban biodiversity. Over 20% of the area of Glasgow is green space including 74 parks, over 30 allotment spaces and other sites of potential importance to urban biodiversity such as rivers, woodlands, cemeteries and communal gardens. In terms of nationally recognised status of nature conservation, Glasgow holds 5 Sites of Special Scientific Interest (SSSIs) and 7 Local Nature Reserves (LNRs). It also has 46 and 49 Sites of Importance for Nature Conservation (SINCs) at the City and Local level respectively[1]. Glasgow City Council (GCC) in a strategic review of its green spaces identified a numbers of key actions including: (a) identifying amenity grass and road verges that could be subject to less intensive maintenance and; (b) the inclusion of biodiversity as an integral part of any development projects (GCC, 2005). GCC also has a programme of habitat enhancement including the naturalisation of artificial ponds and creation of further ponds and wetlands, wildflower meadows and native woodland. In addition the Glasgow Biodiversity Partnership has produced a Local Habitat Statement on "Built Up Areas and Gardens", as part of the Local Biodiversity Action Plan (LBAP) which highlighted the need to raise awareness of urban biodiversity through promoting access, encouraging public participation and the use of appropriate management practices[2].

The importance of urban biodiversity has also been highlighted in the Scottish biodiversity strategy, a 25 year plan for the conservation and enhancement of biodiversity in Scotland. This document sets out five main objectives: halting the loss of biodiversity; increasing awareness of biodiversity and engaging people in conservation; restoring and enhancing biodiversity in urban, rural and marine environments; ensuring that biodiversity is taken into account in all decision making and; ensuring that existing knowledge on biodiversity is available to all policy makers and practitioners (Scottish Government, 2004). The Scottish Biodiversity Forum, in its implementation plans for 2005-2008, has also highlighted that urban green spaces are often poorly managed and sometimes dominated by non-native invasive species that are generally of low value for urban wildlife (Scottish Government, 2005). Consequently, urban environments such as green spaces and corridors offer huge potential for improvement through schemes to conserve and enhance biodiversity.

The Biodiversity in Glasgow (BIG) project was set up as a collaboration between the British Trust for Ornithology Scotland, Butterfly Conservation Scotland and Glasgow City Council and ran from January 2007 to April 2009. The main aim of the project was to carry out the largest ever volunteer survey of the birds, butterflies and their associated habitats within the green spaces of the city. This information was then used to determine which habitats are the most important in terms of enhancing bird and butterfly diversity within green spaces.

METHODS

Site allocation and training

More than 100 green spaces were surveyed during the BIG project and full details are provided in Humphreys *et al.* (2011). The term green space, as used here covers a wide range of sites (eg. parks, cemeteries, allotments, urban woodlands, open spaces[3]) and in over 90% of cases were owned by GCC. Site allocation was based on proximity to either where volunteers lived or worked and wherever possible, were chosen by volunteers themselves. The size of green spaces used in the BIG project ranged from just under 2 ha to 168 ha (although the largest sites were subdivided for the purpose of surveying).

Although some of the BIG volunteers were highly experienced, many people had never carried out a

[1]http://www.glasgow.gov.uk/en/AboutGlasgow/Factsheets/Glasgow/Environment.htm.

[2]http://www.glasgow.gov.uk/NR/rdonlyres/5CF1528F-ABBC-4F8F-A3CC-AD6CFD8E98CB/0/LBDAPurban.pdf

[3] The category of open space describes the various combination of a wide range of possible habitats which are not intensively managed including: wetland, raised bog, burns, woodlands, heathlands, pasture and open water.

survey before. Free training in species identification and survey techniques was therefore offered to all participants. A total of 108 and 88 people were trained for the bird and butterfly surveys respectively. Volunteers also received regular newsletters throughout the project which featured interim results, personal accounts by participants and articles on the best green spaces in Glasgow to visit.

Bird Surveys

Volunteers were recommended to make a pre-survey visit in early April in order to estimate the percentage cover of the different habitats within their site. Three further visits were then made: mid April to mid May, mid May to mid June and mid June to mid July. Ideally survey visits were carried out between dawn and 09:00 but if that was not possible, observers were required to choose a time of day that was convenient and carry out future surveys at this fixed time. Volunteers were requested to walk a survey route in such a way that they covered the whole site to within 50m ensuring that they did not double count any birds eg. either by zigzagging or using parallel lines. Any bird species seen were then counted and allocated to the habitat type in which they were first seen. Species lists for all sites were checked over by GCC staff to identify records that were unlikely. In such instances, if these sightings could not be validated, they were subsequently removed from the site lists (see Humphreys *et. al* 2011).

Butterfly and day-flying moth Surveys

Volunteers were recommended to undertake a pre-survey visit in early May in order to set up their transect routes and estimate the percentage cover of the different habitats within their sites. Transects were designed to take less than 60 minutes, not exceed 2 km in length, and cover a fair representation of the habitats present at the site. A minimum of four monthly visits to carry out the transects were recommended: mid May-mid June, mid-June to mid July, mid-July to mid-August and mid-August to mid-September. Volunteers were requested to walk at a slow, steady pace counting all butterflies and any day-flying moths seen within 2.5m either side of the transect line and 5m ahead. Transects were to be carried out between 10:45 and 15:45 hours BST and ideally in good weather conditions (eg. minimum temp of 11°C and wind speeds less than 5 on the Beaufort scale). All records of butterflies were checked by BC Scotland volunteers who were able to flag up records which were questionable (based on location and time of year). In such instances unless validation was provided the record was deleted (see Humphreys *et. al* 2011).

RESULTS

Birds

A total of 91 species of bird was recorded in the city of Glasgow during the BIG project (with up to 61 species being recorded at one site alone). As expected, many birds were relatively abundant species, but what was surprising was the number with high conservation value. In total, there were 15 UKBAP and 4 LBAP birds species recorded along with 47 species of Birds of Conservation Concern (see Eaton *et al.*, 2009, for definition and Table 1). These key lists included species that have become synonymous with the urban environment such as House Sparrow, Swift and Starling, as well as species that are more commonly associated with rural habitats including Tree Sparrow, Skylark and Yellowhammer.

Analyses were then carried out to look at the habitat associations of birds (see Humphreys *et al.*, 2011 for further details). Species richness was most influenced by the overall size: the larger the green space, the higher the species richness was likely to be. The presence of wild areas (unmown rank grass or wild/weedy areas) had the greatest single effect, with an average of 5.2 more species in green spaces where wild areas were present. The presence of a water body (natural or ornamental) was also found to be important. Green spaces with a water body had an average of 4.9 more species than those without. Furthermore, sites with a wetland/marsh area present had on average 2.8 more species than those sites without.

Butterflies and day-flying moths

Seventeen species of butterflies and 9 species of day-flying moths were recorded in the City of Glasgow by volunteers despite the relatively wet and cold conditions, particularly in 2008 when records were notably lower throughout the whole of the UK. Two species of butterfly had UKBAP listings: Small Heath and Grayling (Fox *et al.*, 2006). Exciting records included Comma, which was the first record for the city. The Comma is a generalist species that has a southerly distribution in Britain, although over the past few decades it has shown northern range expansions, almost certainly due to climate change (Warren *et al.*, 2001) and is therefore likely to become much more widespread in the future. Also of interest were the good numbers of Ringlets which indicate the rapid rate of colonisation of Glasgow by this particular species, which was first reported within the city boundary in 2005. There were conspicuously low numbers of the Common Blue, however, which is consistent with the documented widespread decline across the UK (Botham *et al.*, 2008).

Simple analyses were then carried out to compare the key habitat features of sites in which butterflies were recorded with those of sites having nil records (there were too few records for day-flying moths for any analyses to be meaningful). The mean percentage covers of wildflower/weedy areas for sites with and

without butterflies were not significantly different. However, the mean percentage cover of unmown or rank grass was significantly higher for those sites with butterflies compared with those without. This suggests that the area of unmown grass could be an important determinant of whether butterflies will be present.

RECOMMENDATIONS FOR GREEN SPACE MANAGEMENT

Birds

The overall size of the green space was the most influential factor in determining species richness for birds. Larger sites by their very nature however are more likely to contain a greater number of habitats. Consequently it is difficult to tease apart the relative importance of size of green space in relation to greater diversity of habitats (Chamberlain *et al.*, 2007). Although the size of existing sites cannot be easily augmented, there may be potential to increase area by landscaping adjacent land Alternatively there could be opportunities to join up existing green space through the creation or enhancement of corridors, defined here as linear features with continuous wildlife habitat. Larger green spaces could be incorporated into the design of new towns.

Wild areas (e.g. patches of unmown rank grass and wild/weedy habitats) were also important.These particular habitats holding important numbers of invertebrates or being an important resource for seeds, particularly outside the breeding season. The presence of water bodies creates opportunities for an additional water bird community which could otherwise not be supported e.g. ducks and geese some of which have conservation listing (see Table 1). Wetland and marsh areas were also important for overall species richness and therefore, should accompany the creation of water bodies. Moreover for existing water bodies, there may be scope to incorporate wetland habitat if they do not already exist (e.g. naturalisation of water bodies).

Butterflies

Unmown/ rank grass was shown to be an important factor in determining the presence of butterflies. Some sites, however, had unexpectedly poor numbers of butterflies despite having a high percentage. In such cases, the grassland was likely to be of amenity or agricultural origin and thus of little value to butterflies and moths as food resource (although it may provide over wintering habitat). In such instances the creation of new wildflower-rich or semi-natural grassland should be considered instead.

Consideration should also be given to the frequency of cutting regimes as nectar sources and caterpillars are destroyed by regular mowing. Even annual mowing of grasslands will cause losses to most butterflies and moths, except perhaps those that pupate in the soil. Thus if the site has to be mown, it is always better to have a variety of cutting regimes so a proportion of the population has a chance of survival.

CONCLUSIONS AND LESSONS FOR THE FUTURE

The BIG project was extremely successful in encouraging new volunteers to go out and survey birds and butterflies. Volunteers had often previously felt that they lacked the skills or the confidence to get involved, so offering targeted training really was key to the success of the project. The first-time surveyors also reported taking great satisfaction in developing their identification skills as the project progressed, which really reinforces the message that the only way to truly learn is to get out there and practise!

There was also an issue of people's perception of green spaces particularly when volunteers were allocated a site that was previously unknown to them. A number of volunteers actually voiced their initial misgivings over what were seemingly uninviting green spaces in the spring but by mid summer many of these sites had transformed. Participants also expressed their sheer joy at discovering birds and butterflies found at their site that would have been potentially overlooked by a casual visit.

By informing the management of urban greenspace and promoting the awareness of urban biodiversity, the BIG project made a significant contribution to the LBAP process. GCC has gone onto to be involved with the Glasgow Living Water Project, a partnership with Froglife which has resulted in the creation of new ponds across the city and North Lanarkshire. Although the management of these water bodies is intended to benefit primarily amphibians, it is likely to enhance overall biodiversity. In addition, in 2011 the council started a new partnership project with Buglife called Glasgow's Buzzing which will create and enhance grasslands and meadows for the benefit of bees, butterflies and other key invertebrates. Although the BIG project was initially specific to Glasgow, any generic management advice will have applications for urban green spaces across Scotland and will therefore support the objectives of the Scottish Biodiversity Strategy. Therefore, if lessons from the BIG project are applied to other cities and towns, then we have demonstrated how anyone can help contribute to promoting and conserving biodiversity in Scotland.

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Species	UKBAP	LBAP	BOCC
Pink-footed Goose			Amber List
Greylag Goose			Amber List
Gadwall			Amber List
Mallard			Amber List
Northern Pintail			Amber List
Common Pochard			Amber List
Tufted Duck			Amber List
Grey Partridge			Red List
Little Grebe			Amber List
Common Kestrel			Amber List
Eurasian Oystercatcher			Amber List
Ringed Plover			Amber List
Northern Lapwing	UKBAP		Red List
Eurasian Curlew	UKBAP		Amber List
Common Sandpiper			Amber List
Black-headed Gull			Amber List
Common Gull			Amber List
Lesser Black-backed Gull			Amber List
Herring Gull	UKBAP		Red List
Stock Dove			Amber List
Common Cuckoo	UKBAP		Red List
Common Swift		LBAP	Amber List
Kingfisher			Amber List
Skylark	UKBAP	LBAP	Red list
Meadow Pipit			Amber List
Grey Wagtail			Amber List
Sand Martin			Amber List
Barn Swallow			Amber List
House Martin			Amber List
Dunnock			Amber List
Whinchat			Amber List
Wheatear			Amber List
Song Thrush	UKBAP		Red list
Mistle Thrush			Amber List
Grasshopper Warbler			Red List
Whitethroat			Amber List
Wood Warbler			Red List
Willow Warbler			Amber List
Spotted Flycatcher	UKBAP		Red List
Starling	UKBAP		Red list
House Sparrow	UKBAP		Red List
Tree Sparrow	UKBAP	LBAP	Red List
Common Linnet	UKBAP		Red List
Lesser Redpoll	UKBAP		Red List
Bullfinch	UKBAP		Amber List
Yellowhammer	UKBAP		Red List
Reed Bunting	UKBAP	LBAP	Amber List

Table 1. Species of bird recorded in Glasgow as part of the BIG project which had a conservation listing. BOCC, Birds of Conservation Concern; LBAP, Local Biodiversity Action Plan; UKBAP, UK Biodiversity Action Plan.

Species	UKBAP	LBAP
Small Heath	UKBAP	
Grayling	UKBAP	

Table 2. Species of butterfly and moths recorded in Glasgow as part of the BIG project which had a conservation listing.

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