

## BIODIVERSITY RECORDING AT ROYAL BOTANIC GARDEN EDINBURGH

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### ABSTRACT

The results of recording wildlife at the Edinburgh site of the Royal Botanic Garden Edinburgh (RBGE) are presented in partial fulfilment of the Garden's obligation to deliver the Scottish Biodiversity Duty. So far, 383 animal species (94 birds, 6 mammals, 3 amphibians, 15 butterflies, 79 moths, 48 hymenopterans, 52 hoverflies, 7 dragonflies and damselflies, 48 other insects, 5 spiders, 8 gall-forming mites, 12 rotifers, 5 cladocerans and 1 copepod) have been recorded. Tables giving lists of the various animal groups are presented. Half of the 103 vertebrates are listed in national Red Lists, the Scottish Biodiversity List or the Edinburgh Local Biodiversity Action Plan List of Notable Species.

### INTRODUCTION

The Royal Botanic Garden Edinburgh has a major international reputation in plant biodiversity research. It is only in recent years, however, that the importance of its four gardens at Edinburgh, Benmore (Argyll), Dawyck (Peeblesshire) and Logan (Dumfries & Galloway) as reservoirs of biodiversity in their own right has been appreciated.

In addition, as a public body, RBGE now has legal responsibilities and obligations that it previously did not, with respect to biodiversity conservation. Section 1(1) of the Nature Conservation (Scotland) Act (2004), which came into effect on 29 November 2004, states that "It is the duty of every public body and office-holder, in exercising any functions, to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions", while Section 1(2) states that, in complying with the Act, public bodies must have regard to the Scottish Biodiversity Strategy. This was prepared for the Scottish Government by a partnership of public bodies and NGOs known as the Scottish Biodiversity Forum (Scottish Parliament, 2004; Scottish Biodiversity Forum, 2004). More recently, many provisions of the Wildlife and Natural Environment (Scotland) Act 2011 came into force on 1 January 2012, including Section 36 which stipulates that public bodies must prepare and publish a biodiversity report within three years of the base date (Scottish Parliament, 2011a, 2011b).

RBGE also recently began implementing an Environmental Management System (EMS) with a view to receiving accreditation under the international standard ISO 14001.

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As part of this EMS, five Environmental Working Groups were set up covering aspects of RBGE's impact on the environment (known as Utilities, Transport, Procurement, Waste and Biodiversity Groups). The Biodiversity Working Group presently comprises eight RBGE staff and volunteers. RBGE has also prepared an Environmental Policy, which states that we will "enhance our role in promoting and protecting biodiversity both locally through the management of our sites in Scotland and internationally through our conservation work in the UK and worldwide" (RBGE, 2011).

Before any public body can begin to protect and conserve the wildlife on its land in order to meet its obligations under the biodiversity legislation outlined above, it needs to know what is there. However, little has been known hitherto about the extent or variety of animal biodiversity that uses the Garden's habitats. The Edinburgh Garden is visited by many species of birds and mammals to feed, drink and bathe, and a large proportion are resident on the site. From spring to the autumn frosts, the Garden is also visited by insects and invertebrates. Many are seeking pollen or nectar and thus benefit the Garden by effecting pollination; others are predators that keep down pests.

#### METHODS

Since 2004, I have been recording and monitoring major wildlife groups represented at the Edinburgh Garden. Bird records, in fact, go back to 1997 but more systematic, computerised recording commenced in 2004. Recording of butterflies and terrestrial mammals began in 2007, Odonata (dragonflies and damselflies) in 2008, Hymenoptera (bees, wasps and ants) and hoverflies in 2009, and spiders and leaf-mining insects and mites in 2011. As well as my own records, I have received some for butterflies and Odonata from 2005 onwards from two local naturalists. There have been three efforts to trap moths, and zooplankton were sampled by an external expert in 2010. Garden staff regularly pass on their own sightings to me. There is also a list of bryophytes found in the Scottish Heath Garden; however, that is outside the scope of this paper.

I record wildlife at RBGE each working day throughout the year, which gives a maximum of about 220 possible recording days per year. Recording is done while walking across the Garden to my office in the morning, and during the lunch hour. Birds tend to be most active in the morning and invertebrates during the middle of the day so these two recording periods, though both necessarily time-limited, complement each other well. Field records are, especially in the case of creatures requiring identification, supplemented with digital images taken using the macro facility of a Panasonic TZ6 camera. Records are archived on RBGE's computer network, with separate sets of files for birds, mammals and invertebrates. The day's sightings are also emailed to the John Hope Gateway, where they are put on public display together with a selection of recent wildlife images taken in the Garden.

For each animal group, the following types of record are kept:

- Year lists of species seen, for the calendar year and in the case of birds also for

the Garden's reporting year (April to March). Since insects are virtually absent between November and February the calendar and reporting year lists would be almost identical, so only the former is kept.

- A cumulative list of all species seen since recording of the group began.
- Since 2007, a monthly list giving the bird sightings for each day; since 2012 this has been extended to include Hymenoptera, hoverflies and butterflies. Also since 2012, the charts on which these monthly data are recorded have been modified to include the Biological Standard Weeks, according to the perpetual system adopted by many biological recording institutions in which each calendar day is always in the same week whatever the year. In this system, week 1 begins on 1 January, week 9 includes 29 February if a leap year, and 31 December is included as an extra day in week 52. Examples of this system can be found in Plant (1994) and Somerset Moth Group (2012).

As part of the Scottish Biodiversity Strategy, a list of species (*The Scottish Biodiversity List*) has been compiled "that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland" (Scottish Natural Heritage, 2010). This list contains 20 terrestrial mammals, 3 reptiles and amphibians (referred to therein as "herptiles"), 93 birds, 289 terrestrial invertebrates, 10 fish, 236 vascular plants, 208 bryophytes, 8 charophytes, 176 fungi, 523 lichens and 240 desmids (Blake, 2005). In addition, a list of "notable species" for Edinburgh has been produced as part of the Edinburgh Local Biodiversity Action Plan (LBAP) (Edinburgh Biodiversity Partnership, 2010a, 2010b). Also, for the animal groups currently recorded at RBGE, there are national Red Lists or equivalent for birds (British Trust for Ornithology, 2009), mammals (Harris *et al.*, 1995) and butterflies (Fox *et al.*, 2010). As well as simply recording species, therefore, those occurring at RBGE are where possible categorised according to whether they are on one or more of these lists. A draft list of notable species occurring at the Edinburgh Garden and at Benmore has recently been compiled, with recommendations on how Garden land can be managed to protect or increase these species where appropriate (Mill, 2012).

## RESULTS AND DISCUSSION

So far (to 30 March 2012), 383 animal species have been recorded at the Edinburgh Garden: 103 vertebrates (94 birds, 6 mammals, 3 amphibians) and 280 invertebrates (15 butterflies, 79 moths, 48 hymenopterans, 52 hoverflies, 7 dragonflies and damselflies, 48 other insects, 5 spiders, 8 gall-forming mites, 12 rotifers, 5 cladocerans and 1 copepod). Where a species has both a scientific and a common name, the latter, e.g. house sparrow, is used in the text, with the scientific name (in that example, *Passer domesticus*) listed in the relevant table.

*Birds (1997–2012: Table 1)*

Of the 94 bird species, 86 have been recorded since 1997; 43 of those (50 per cent) are either Red- or Amber-listed in *Birds of Conservation 3* (British Trust for Ornithology, 2009) with 11 (plus one now locally extinct) Red-Listed. Three Red-Listed species (herring gull, song thrush, house sparrow) are resident or daily visitors although house sparrows are now confined to two small roost sites, one of which has apparently been unused for almost a year. Two (redwing and fieldfare) are winter visitors, while six (Arctic skua, lesser redpoll, linnet, skylark, spotted flycatcher and starling) are only occasional. Spotted flycatcher, however, bred in the Garden at least until the 1980s (McBeath, 1989). Hawfinch, another Red-listed bird, also frequented the Edinburgh Garden from 1947 and annually between 1974 and 1992 (McBeath, 1989; Duncan, 1999; H. Noltie, pers. comm.) but is now absent throughout Edinburgh apart from very occasional unconfirmed sightings. The 31 Amber-Listed species include 5 resident breeders (bullfinch, dunnoek, mallard, mistle thrush, stock dove), 3 gull species that visit regularly, 4 summer visitors (house martin, swallow, swift, willow warbler), 4 other regular visitors (grey wagtail, kingfisher, mute swan, oystercatcher; swans have attempted to breed, so far unsuccessfully) and 15 occasional visitors or passage migrants.

Less common breeding birds include sparrowhawk (monitored by Lothian and Borders Raptor Study Group who have also collaborated with RBGE to get webcam footage of the nests to the John Hope Gateway), great spotted woodpecker and, at least until recently, tawny owl, which seems to have become much less regular in its visits to RBGE in the last few years.

Unusual bird visitors to the Edinburgh Garden have included crossbill in July 2008 (a national irruption year for the species) and winter 2010, no fewer than five goosanders on the Pond on 18 October 2011, four grey plovers bathing in the recently created Biodiversity Garden ponds (10 November 2011), peregrine, pheasant, raven, reed bunting (a singing male, 2006), sedge warbler (another singing male, 2007), skylark (on a very snowy day in December 2010), a snipe with a damaged bill that had to be humanely despatched by the RSPB and woodcock (late autumn/winter records in 2007, 2010 and 2011). The most extraordinary bird to have visited the Garden so far must surely be a white stork that turned up on 22 May 2011 and later that week visited the Gyle shopping centre and Princes Street Gardens.

Daily recording of birds has resulted in the discovery that RBGE is on a migration route for meadow pipit, visible migration of which can often be seen for a few days in spring (migrating inland) and autumn (migrating east, out to sea). Some species have dramatically increased, such as goldfinch, while others have greatly declined in frequency of occurrence or have disappeared completely, such as collared dove. Table 1 includes eight species that used to occur at least occasionally in RBGE or the skies above prior to 1990 (McBeath, 1989) but have not been seen since my recording began.

	Common name	Scientific name	Family	Listings	Years recorded
1	Sparrowhawk	<i>Accipiter nisus</i>	Accipitridae	E	00–12
2	Buzzard	<i>Buteo buteo</i>	Accipitridae	E	02, 06–12
3	Long-tailed tit	<i>Aegithalos caudatus</i>	Aegithalidae		97–12
4	Skylark	<i>Alauda arvensis</i>	Alaudidae	R, S, E	10
5	Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	A, S, E	98–02, 04–12
6	Little auk	<i>Alle alle</i>	Alcidae		H
7	Wigeon	<i>Anas penelope</i>	Anatidae	A, E	H
8	Mallard	<i>Anas platyrhynchos</i>	Anatidae	A, E	97–12
9	Greylag goose	<i>Anser anser</i>	Anatidae	A, E	08–11
10	Pink-footed goose	<i>Anser brachyrhynchus</i>	Anatidae	A, E	98–99, 01, 04–12
11	Tufted duck	<i>Aythya fuligula</i>	Anatidae	A	00, 03, 06, 10, 11
12	Canada goose	<i>Branta canadensis</i>	Anatidae		09
13	Goldeneye	<i>Bucephala clangula</i>	Anatidae	A, E	09
14	Whooper swan	<i>Cygnus cygnus</i>	Anatidae	A, S, E	06, 10
15	Mute swan	<i>Cygnus olor</i>	Anatidae	A, E	00–12
16	Goosander	<i>Mergus merganser</i>	Anatidae	E	11
17	Swift	<i>Apus apus</i>	Apodidae	A, S, E	00–12
18	Grey heron	<i>Ardea cinerea</i>	Ardeidae		97–12
19	Night heron	<i>Nycticorax nycticorax</i>	Ardeidae		H
20	Waxwing	<i>Bombycilla garrulus</i>	Bombycillidae		00–05, 08, 10, 11
21	Treecreeper	<i>Certhia familiaris</i>	Certhiidae		97–12
22	Grey plover	<i>Pluvialis squatarola</i>	Charadriidae	A	11
23	White stork	<i>Ciconia ciconia</i>	Ciconiidae		11
24	Dipper	<i>Cinclus cinclus</i>	Cinclidae		H
25	Feral pigeon (rock dove)	<i>Columba livia</i>	Columbidae		97–12
26	Stock dove	<i>Columba oenas</i>	Columbidae	A, E	99–12
27	Woodpigeon	<i>Columba palumbus</i>	Columbidae		97–12
28	Collared dove	<i>Streptopelia decaocto</i>	Columbidae		97–05, 10
29	Raven	<i>Corvus corax</i>	Corvidae		09, 10
30	Hooded crow	<i>Corvus cornix</i>	Corvidae	S	08, 11
31	Carrion crow	<i>Corvus corone</i>	Corvidae		97–12
32	Rook	<i>Corvus frugilegus</i>	Corvidae		04–06, 11
33	Jackdaw	<i>Corvus monedula</i>	Corvidae		08–12
34	Jay	<i>Garrulus glandarius</i>	Corvidae		11

	Common name	Scientific name	Family	Listings	Years recorded
35	Magpie	<i>Pica pica</i>	Corvidae		97–12
36	Reed bunting	<i>Emberiza schoeniclus</i>	Emberizidae	A, S, E	06
37	Peregrine	<i>Falco peregrinus</i>	Falconidae	S, E	08, 09
38	Kestrel	<i>Falco tinnunculus</i>	Falconidae	A, S, E	07, 12
39	Lesser redpoll	<i>Carduelis cabaret</i>	Fringillidae	R	09, 10
40	Linnet	<i>Carduelis cannabina</i>	Fringillidae	R, S, E	97, 98, 01, 04–08, 10
41	Goldfinch	<i>Carduelis carduelis</i>	Fringillidae		98, 01, 02, 04–12
42	Siskin	<i>Carduelis spinus</i>	Fringillidae	S	98–12
43	Greenfinch	<i>Chloris chloris</i>	Fringillidae		98–12
44	Hawfinch	<i>Coccothraustes coccothraustes</i>	Fringillidae	R, S	pre-97; unconfirmed more recent sightings
45	Chaffinch	<i>Fringilla coelebs</i>	Fringillidae		97–12
46	Brambling	<i>Fringilla montifringilla</i>	Fringillidae	S, E	11
47	Crossbill	<i>Loxia curvirostra</i>	Fringillidae		08, 10
48	Bullfinch	<i>Pyrrhula pyrrhula</i>	Fringillidae	A, S, E	98–12
49	Oystercatcher	<i>Haematopus ostralegus</i>	Haematopodidae	A, E	02–12
50	House martin	<i>Delichon urbica</i>	Hirundinidae	A, E	98, 00–11
51	Swallow	<i>Hirundo rustica</i>	Hirundinidae	A, E	04–11
52	Blackheaded gull	<i>Chroicocephalus ridibundus</i>	Laridae	A, S	98, 02–12
53	Herring gull	<i>Larus argentatus</i>	Laridae	R, S, E	98–12
54	Common (mew) gull	<i>Larus canus</i>	Laridae	A, E	03–11
55	Lesser black-backed gull	<i>Larus fuscus</i>	Laridae	A, E	98, 01–12
56	Meadow pipit	<i>Anthus pratensis</i>	Motacillidae	A, E	07–09, 11
57	Pied wagtail	<i>Motacilla alba</i>	Motacillidae		00, 02–11
58	Grey wagtail	<i>Motacilla cinerea</i>	Motacillidae	A	05–11
59	Spotted flycatcher	<i>Muscicapa striata</i>	Muscicapidae	R, S, E	09
60	Blue tit	<i>Cyanistes caeruleus</i>	Paridae		97–12
61	Great tit	<i>Parus major</i>	Paridae		97–12
62	Coal tit	<i>Pariparus ater</i>	Paridae		97–12
63	House sparrow	<i>Passer domesticus</i>	Passeridae	R, E	03, 06–11
64	Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoridae	E	98, 02, 07, 10, 12
65	Pheasant	<i>Phasianus colchicus</i>	Phasianidae		97, 99, 05–07, 11–12

	Common name	Scientific name	Family	Listings	Years recorded
66	Great spotted woodpecker	<i>Dendrocopos major</i>	Picidae		01, 03–12
67	Green woodpecker	<i>Picus viridis</i>	Picidae	A, E	02, 09
68	Dabchick (little grebe)	<i>Tachybaptus ruficollis</i>	Podicipedidae	A	01, 08
69	Fulmar	<i>Fulmarus glacialis</i>	Procellariidae	A, E	H
70	Dunnock	<i>Prunella modularis</i>	Prunellidae	A, E	97–12
71	Coot	<i>Fulica atra</i>	Rallidae		H
72	Moorhen	<i>Gallinula chloropus</i>	Rallidae		97–12
73	Water rail	<i>Rallus aquaticus</i>	Rallidae	E	H
74	Snipe	<i>Gallinago gallinago</i>	Scolopacidae	A, E	09
75	Curlew	<i>Numenius arquata</i>	Scolopacidae	A, S, E	04–12
76	Woodcock	<i>Scolopax rusticola</i>	Scolopacidae	A, S, E	07, 10, 11
77	Redshank	<i>Tringa totanus</i>	Scolopacidae	A, E	04, 09–11
78	Arctic skua	<i>Stercorarius parasiticus</i>	Stercorariidae	R, S	09
79	Short-eared owl	<i>Asio flammeus</i>	Strigidae	A, S	H
80	Tawny owl	<i>Strix aluco</i>	Strigidae		97–08, 10, 11
81	Starling	<i>Sturnus vulgaris</i>	Sturnidae	R, E	01, 04, 05
82	Sedge warbler	<i>Acrocephalus schoenobaenus</i>	Sylviidae		07
83	Chiffchaff	<i>Phylloscopus collybita</i>	Sylviidae		98, 00, 02–12
84	Willow warbler	<i>Phylloscopus trochilus</i>	Sylviidae	A, E	97–11
85	Goldcrest	<i>Regulus regulus</i>	Sylviidae	E	97–12
86	Blackcap	<i>Sylvia atricapilla</i>	Sylviidae		00, 03–12
87	Garden warbler	<i>Sylvia borin</i>	Sylviidae		97, 12
88	Wren	<i>Troglodytes troglodytes</i>	Troglodytidae		98–12
89	Robin	<i>Erithacus rubecula</i>	Turdidae	S, E	97–12
90	Redwing	<i>Turdus iliacus</i>	Turdidae	R, S, E	97, 98, 00–12
91	Blackbird	<i>Turdus merula</i>	Turdidae		97–12
92	Song thrush	<i>Turdus philomelos</i>	Turdidae	R, S, E	97–12
93	Fieldfare	<i>Turdus pilaris</i>	Turdidae	R, E	02, 07, 09–11
94	Mistle thrush	<i>Turdus viscivorus</i>	Turdidae	A, E	01–12

Table 1 Birds recorded at RBGE's Edinburgh Garden, 1997–2012 (March). Listings: R: UK National BAP Red List; A: UK National BAP Amber List; S: Scottish Biodiversity List; E: Edinburgh LBAP Notable Species list. The list also includes eight species not seen since 1997 but listed as occurring at RBGE in the past by McBeath (1989). These are indicated by 'H' (historic) in the last column. In all tables the first two digits of the year are omitted, e.g. 02 = 2002.

*Mammals and amphibians (2007–2012: Table 2)*

At least two of the six mammals (badger, otter) and all three amphibians (common frog, smooth and palmate newts) so far recorded are on the Scottish Biodiversity List, although the palmate newts were apparently deliberately introduced in 2011 (H. Coventry, pers. comm.). The only ones that visitors are likely to see, apart from the ever-present grey squirrels, are an occasional daytime-roaming fox, and common frog. Evidence of the nocturnal activities of the badgers that arrived at the Edinburgh Garden in 2008 is, however, all too apparent in their damage to the lawns. Since their arrival the badgers have made numerous setts around the site, all of which have been mapped in order that the Garden can meet its obligations to protect this Lothian LBAP species under the Protection of Badgers Act 1992. An otter, probably disturbed by ongoing flood prevention works at the nearby Water of Leith, was seen in November 2011. Pipistrelle bats visit the Edinburgh Garden at dusk on warm evenings from spring to autumn; it is not yet known if these are common pipistrelles or soprano pipistrelles, the recently segregated species that has a higher-pitched echo-location frequency. Both are Scottish Biodiversity List species. Elsewhere in Edinburgh and Lothians, there is evidence that soprano pipistrelle is the commoner of the two species (Clear, 2005; Middleton, 2006); one cannot exclude the possibility that both species may visit the Garden. Nothing is yet known about any small nocturnal mammals that may frequent the Garden.

	Common name	Scientific name	Family	Listings	Years recorded
1	Fox	<i>Vulpes vulpes</i>	Canidae		07–12
2	Field vole	<i>Microtus agrestis</i>	Cricetidae		09
3	Badger	<i>Meles meles</i>	Mustelidae	S, E	09–12
4	Otter	<i>Lutra lutra</i>	Mustelidae	E	11
5	Grey squirrel	<i>Sciurus carolinensis</i>	Sciuridae		07–12
6	Common & soprano pipistrelle bats	<i>Pipistrellus pipistrellus</i> [common], <i>P. pygmaeus</i> [soprano]	Vespertilionidae	S (both), E (both)	07
7	Common frog	<i>Rana temporaria</i>	Ranidae		09, 11, 12
8	Smooth newt	<i>Lissotriton vulgaris</i>	Salamandridae		09
9	Palmate newt	<i>Lissotriton helveticus</i>	Salamandridae		11

Table 2 Mammals and amphibians recorded at RBGE's Edinburgh Garden, 2007–2012. Listings codes as for Table 1.

*Butterflies and moths (2005–2012: Tables 3 and 4)*

Fifteen butterfly species have been recorded at RBGE by me or Hugh and Laura Coventry (pers. comm.), although one (large white) has not been seen for several years (Table 3). None is endangered or on the Scottish Biodiversity or Edinburgh LBAP Lists.



However, several are species that have recently spread dramatically in Scotland, almost certainly as a result of climate change. These include comma, peacock, speckled wood and holly blue. The spreads or invasions of all these (and others not yet recorded from RBGE) in Scotland have been documented by Sutcliffe (2009). RBGE is notable for having one of the few Scottish colonies of the holly blue, which in a good season can produce two broods, flying in spring (April/May) and late summer (July/August). It was first reported at RBGE in 2007 (Sutcliffe, 2007 and own records) and has been seen annually since, except in 2009 when it was surely overlooked. The comma had been absent from Scotland for 130 years until it was reported in 1996, in the Borders. Since then it has spread rapidly northwards. The first Lothians record was in 2002 (Sutcliffe, 2009); it has been recorded at RBGE since 2008. The first confirmed occurrence of speckled wood in Edinburgh was on 8 June 2008 when one was seen “on a riverside path shaded with trees” (Butterfly Conservation, 2008); there are RBGE records from 13 June 2008 (unconfirmed) and 2011 (H. Coventry, pers. comm.).

A total of 79 moth species have been recorded at RBGE (Table 4). Most were trapped on the evenings of 20 June 2008, 3 and 4 July 2009 and 15 August 2009, with the July 2009 evenings yielding most records. All are common species, not on the Edinburgh LBAP or Scottish Biodiversity Lists. On 21 July 2011, I recorded yarrow plume-moth (Fig. 1) resting on its food plant, yarrow (*Achillea millefolium*) – surprisingly the first record of this species for Midlothian (v.c. 83) although it is widespread in Scotland.

	Common name	Scientific name	Family	Years recorded
1	Holly blue	<i>Celastrina argiolus</i>	Lycaenidae	07, 08, 10, 11
2	Small copper*	<i>Lycaena phlaeas</i>	Lycaenidae	08–11
3	Common blue*	<i>Polyommatus icarus</i>	Lycaenidae	08, 09, 10
4	Orange-tip*	<i>Anthocharis cardamines</i>	Pieridae	10
5	Large white	<i>Pieris brassicae</i>	Pieridae	pre-2008
6	Green-veined white*	<i>Pieris napi</i>	Pieridae	09, 10, 11
7	Small white*	<i>Pieris rapae</i>	Pieridae	07–11
8	Ringlet*	<i>Aphantopus hyperantus</i>	Satyridae	08*, 10
9	Meadow brown*	<i>Maniola jurtina</i>	Satyridae	08, 09, 10
10	Speckled wood	<i>Pararge aegeria</i>	Satyridae	08 unconfirmed, 11
11	Small tortoiseshell*	<i>Aglais urticae</i>	Vanessidae	07–11
12	Peacock*	<i>Inachis io</i>	Vanessidae	07–11
13	Comma*	<i>Polygonia c-album</i>	Vanessidae	08–11
14	Red admiral*	<i>Vanessa atalanta</i>	Vanessidae	07–11
15	Painted lady*	<i>Vanessa cardui</i>	Vanessidae	07, 08, 10

Table 3 Butterflies recorded at RBGE's Edinburgh Garden, 2007–2011. An asterisk (\*) after the English name indicates that the species was also recorded prior to 2007 (H. Coventry, pers. comm.). None is Listed.

	Common name	Scientific name	Family	Years recorded
1	Ghost moth	<i>Hepialus humuli humuli</i>	Hepialidae	08
2	Map-winged swift	<i>Hepialus fusconebulosa</i>	Hepialidae	09
3	a micro-moth	<i>Stigmella splendidissimella</i>	Nepticulidae	09
4	a micro-moth	<i>Stigmella sorbi</i>	Nepticulidae	11*
5	a micro-moth	<i>Stigmella tityrella</i>	Nepticulidae	09
6	a micro-moth	<i>Incurvaria pectinea</i>	Incurvariidae	11*
7	a micro-moth	<i>Heliozela sericiella</i>	Heliozelidae	09
8	Apple leaf miner	<i>Lyonetia clerkella</i>	Lyonetiidae	09, 11*
9	a micro-moth	<i>Caloptilia rufipennella</i>	Gracillariidae	09
10	a micro-moth	<i>Caloptilia syringella</i>	Gracillariidae	09, 11*
11	a micro-moth	<i>Parornix scoticella</i>	Gracillariidae	11*
12	a micro-moth	<i>Phyllonorycter maestingella</i>	Gracillariidae	09
13	a micro-moth	<i>Phyllonorycter ulmifoliella</i>	Gracillariidae	09
14	a micro-moth	<i>Argyresthia brockeella</i>	Yponomeutidae	09
15	a micro-moth	<i>Argyresthia goedartella</i>	Yponomeutidae	09
16	Diamond-back moth	<i>Plutella xylostella</i>	Yponomeutidae	09
17	Brown house-moth	<i>Hofmannophila pseudospretella</i>	Oecophoridae	09
18	a micro-moth	<i>Carcina quercana</i>	Oecophoridae	09
19	a micro-moth	<i>Blastobasis adustella (= lignea)</i>	Blastobasidae	09
20	a micro-moth	<i>Blastobasis decolorella</i>	Blastobasidae	08
21	Dark fruit-tree tortrix	<i>Pandemis heparana</i>	Tortricidae	09
22	a micro-moth	<i>Aphelia unitana</i>	Tortricidae	09
23	Light brown apple moth	<i>Epiphyas postvittana</i>	Tortricidae	10 (LS pers. comm.)
24	a micro-moth	<i>Lozotaenia forsterana</i>	Tortricidae	09
25	a micro-moth	<i>Acleris sparsana</i>	Tortricidae	09
26	a micro-moth	<i>Celypha lacunana</i>	Tortricidae	09
27	Nut bud moth	<i>Epinotia tenerana</i>	Tortricidae	09
28	a micro-moth	<i>Lathronympha strigana</i>	Tortricidae	09
29	a micro-moth	<i>Chrysoteuchia culmella</i>	Crambidae	09
30	a micro-moth	<i>Agriphila straminella</i>	Crambidae	09
31	a micro-moth	<i>Agriphila tristella</i>	Crambidae	09
32	a micro-moth	<i>Scoparia ambigualis</i>	Crambidae	09
33	a micro-moth	<i>Udea olivalis</i>	Crambidae	08, 09

	Common name	Scientific name	Family	Years recorded
34	Bee moth	<i>Aphomia sociella</i>	Pyralidae	09
35	Beautiful plume	<i>Amblyptilia acanthadactyla</i>	Pterophoridae	09
36	Triangle plume	<i>Platyptilia gonodactyla</i>	Pterophoridae	09
37	Yarrow plume	<i>Platyptilia pallidactyla</i>	Pterophoridae	11* NCR
38	Common lutestring	<i>Ochropacha duplaris</i>	Thyatiridae	08, 09
39	Small fan-footed wave	<i>Idaea biselata</i>	Geometridae	09
40	Small dusty wave	<i>Idaea seriata</i>	Geometridae	09
41	Riband wave	<i>Idaea aversata</i>	Geometridae	09
42	Silver-ground carpet	<i>Xanthorhoe montanata</i>	Geometridae	08, 09
43	The phoenix	<i>Eulithis prunata</i>	Geometridae	09
44	Common marbled carpet	<i>Chloroclysta truncata</i>	Geometridae	08, 09
45	Barred yellow	<i>Cidaria fulvata</i>	Geometridae	09
46	Spruce carpet	<i>Thera britannica</i>	Geometridae	08
47	Clouded border	<i>Lomaspilis marginata</i>	Geometridae	09
48	Brimstone moth	<i>Opisthograptis luteolata</i>	Geometridae	08, 09, 10*
49	Peppered moth	<i>Biston betularia</i>	Geometridae	09
50	Willow beauty	<i>Peribatodes rhomboidaria</i>	Geometridae	09
51	Satin beauty	<i>Deileptenia ribeata</i>	Geometridae	09
52	Mottled beauty	<i>Alcis repandata</i>	Geometridae	09
53	Bordered white	<i>Bupalus piniaria</i>	Geometridae	09
54	Common white wave	<i>Cabera pusaria</i>	Geometridae	09
55	Light emerald	<i>Campaea margaritata</i>	Geometridae	09
56	Barred red	<i>Hylaea fasciaria</i>	Geometridae	08, 09
57	Poplar hawkmoth	<i>Laothoe populi</i>	Sphingidae	11*
58	Turnip moth	<i>Agrotis segetum</i>	Noctuidae	08
59	Heart and dart	<i>Agrotis exclamationis</i>	Noctuidae	08
60	Large yellow underwing	<i>Noctua pronuba</i>	Noctuidae	08, 09
61	Lesser yellow underwing	<i>Noctua comes</i>	Noctuidae	09
62	Lesser broad-bordered yellow underwing	<i>Noctua janthe</i>	Noctuidae	09
63	Purple clay	<i>Diarsia brunnea</i>	Noctuidae	09
64	Double square-spot	<i>Xestia triangulum</i>	Noctuidae	09
65	Dotted clay	<i>Xestia baja</i>	Noctuidae	09

	Common name	Scientific name	Family	Years recorded
66	Square-spot rustic	<i>Xestia xanthographa</i>	Noctuidae	09
67	Antler moth	<i>Cerapteryx graminis</i>	Noctuidae	09
68	Smoky wainscot	<i>Mythimna impura</i>	Noctuidae	09
69	Dark arches	<i>Apamea monoglypha</i>	Noctuidae	09
70	Tawny marbled minor	<i>Oligia latruncula</i>	Noctuidae	09
71	Middle-barred minor	<i>Oligia fasciuncula</i>	Noctuidae	09
72	Tawny marbled or Marbled minor	<i>Oligia strigilis</i> agg.	Oecophoridae	08, 10*
73	Common rustic	<i>Mesapamea secalis</i>	Noctuidae	09
74	Small dotted buff	<i>Photedes minima</i>	Noctuidae	09
75	Burnished brass	<i>Diachrysia chrysitis</i>	Noctuidae	09
76	Beautiful golden	<i>Autographa pulchrina</i>	Noctuidae	09
77	Straw dot	<i>Rivula sericealis</i>	Noctuidae	09
78	The snout	<i>Hypena proboscidalis</i>	Noctuidae	09
79	The fan-foot	<i>Zanclognatha tarsipennalis</i>	Noctuidae	09

Table 4 Moths recorded at RBGE's Edinburgh Garden, 2008–2011. Primarily based on records made by Duncan Davidson (2008) and Amy Huff (2009). Records made by the author are marked with an asterisk (\*). LS: Lawrie Springate; NCR: new vice-county record. None is Listed.

#### *Bees, wasps and ants (Hymenoptera) (2009–2012: Table 5)*

At least 48 species of Hymenoptera have been recorded at RBGE since 2009; some records from 2007 and 2008 contain no additional species. They include 3 species of ant, 11 bumblebees, the honey bee, 3 leaf-cutting bees, 20 other solitary bees, 1 cuckoo bee, 2 parasitic wasps, 1 digger wasp, 1 potter wasp, 3 sawflies and 2 social wasps. Five of the solitary bees are on the Scottish Biodiversity List, with two (*Colletes daviesanus* and *Osmia rufa*) also on the Edinburgh LBAP notable species list. By far the most noteworthy is the wool carder bee (Fig. 2), a pair of which were recorded on the Rock Garden for several weeks between July and August 2011. This was the first ever record of wool carder bee anywhere in the Lothians, and the first Scottish record outside Dumfries and Galloway, where it is fairly widespread and has been known for over a century. A full account of this discovery will be published elsewhere. At RBGE, the wool carder bees were favouring one of their known food plants, *Sempervivum*. As RBGE has a 'green roof' on the John Hope Gateway, it remains to be seen whether this will also attract wool carder bees, as 'green roofs' have done elsewhere (Colla *et al.*, 2009; Dunnett *et al.*, 2011), and so encourage RBGE's tiny population to flourish.

	Species	Family	Group	Listings	Years recorded
1	<i>Ichneumon xanthorius</i>	Ichneumonidae	Parasitic wasp		10
2	<i>Rhyssa persuasoria</i>	Ichneumonidae	Parasitic wasp		11
3	<i>Mimesa equestris</i>	Sphecidae	Digger wasp		09–11
4	<i>Ancistrocerus scoticus</i>	Vespidae	Potter wasp		09–11
5	<i>Dolichovespula sylvestris</i>	Vespidae	Social wasp		11
6	<i>Vespula vulgaris</i>	Vespidae	Social wasp		09–12
7	<i>Nomada marshamella</i>	Anthophoridae	Cuckoo bee		10
8	<i>Andrena barbilabris</i>	Andrenidae	Solitary bee		11
9	<i>Andrena bicolor</i>	Andrenidae	Solitary bee		09–12
10	<i>Andrena chrysoceles</i>	Andrenidae	Solitary bee		09
11	<i>Andrena denticulata</i>	Andrenidae	Solitary bee		10, 11
12	<i>Andrena dorsata</i>	Andrenidae	Solitary bee		10, 11
13	<i>Andrena flavipes</i>	Andrenidae	Solitary bee		10, 11
14	<i>Andrena haemorrhoea</i>	Andrenidae	Solitary bee		10, 11
15	<i>Andrena helvola</i>	Andrenidae	Solitary bee		10, 11
16	<i>Andrena nigroaenea</i>	Andrenidae	Solitary bee		12
17	<i>Andrena scotica</i>	Andrenidae	Solitary bee		09, 11
18	<i>Andrena semilaevis</i>	Andrenidae	Solitary bee		11
19	<i>Andrena tarsata</i>	Andrenidae	Solitary bee		10
20	<i>Colletes daviesanus</i>	Colletidae	Solitary bee	S, E	09
21	<i>Halictus rubicundus</i>	Halictidae	Solitary bee		09, 11
22	<i>Halictus tumulorum</i>	Halictidae	Solitary bee		09, 11
23	<i>Lasioglossum villosulum</i>	Halictidae	Solitary bee	S	09–11
24	<i>Lasioglossum calcatum</i>	Halictidae	Solitary bee		11
25	<i>Anthidium manicatum</i>	Megachilidae	Solitary bee	S	11 NCR
26	<i>Megachile centuncularis</i>	Megachilidae	Leaf-cutting bee		10
27	<i>Megachile ligniseca</i>	Megachilidae	Leaf-cutting bee		09
28	<i>Megachile willughbiella</i>	Megachilidae	Leaf-cutting bee		11
29	<i>Osmia rufa</i>	Megachilidae	Solitary bee	S, E	10
30	<i>Melitta haemorrhoidalis</i>	Melittidae	Solitary bee		09
31	<i>Apis mellifera</i>	Apidae	Honey bee		09–12
32	<i>Bombus bohemicus</i>	Apidae	Bumblebee		09, 10, 12
33	<i>Bombus campestris</i>	Apidae	Bumblebee		09–11

	Species	Family	Group	Listings	Years recorded
34	<i>Bombus hortorum</i>	Apidae	Bumblebee		09–12
35	<i>Bombus jonellus</i>	Apidae	Bumblebee		09, 10
36	<i>Bombus lapidarius</i>	Apidae	Bumblebee		09–12
37	<i>Bombus lucorum</i>	Apidae	Bumblebee		09–12
38	<i>Bombus muscorum</i>	Apidae	Bumblebee	S	09–11
39	<i>Bombus pascuorum</i>	Apidae	Bumblebee		09–12
40	<i>Bombus pratorum</i>	Apidae	Bumblebee		09–12
41	<i>Bombus sylvestris</i>	Apidae	Bumblebee		09–11
42	<i>Bombus terrestris</i>	Apidae	Bumblebee		09–12
43	<i>Allantus cinctus</i>	Tenthredinidae	Sawfly		09
44	<i>Tenthredo arcuata</i>	Tenthredinidae	Sawfly		10
45	<i>Tenthredo brevicornis</i>	Tenthredinidae	Sawfly		11
46	<i>Lasius niger</i>	Formicidae	Ant		09–11
47	<i>Myrmica ruginodis</i>	Formicidae	Ant		10
48	<i>Tetramorium caespitum</i>	Formicidae	Ant		11

Table 5 Hymenoptera recorded at RBGE's Edinburgh Garden, 2009–2011, with some records from January to March 2012 also included. NCR: new vice-county record. Listings codes as in Table 1.

#### *Hoverflies (2009–2011: Table 6)*

Just over 100 hoverfly species (Diptera: Syrphidae) have been recorded in Edinburgh, as can be found by typing any Edinburgh postcode (between EH1 and EH19) into the Hoverfly Recording Scheme's (HRS) website (Hoverfly Recording Scheme, 2005). At least 52, about half the Edinburgh total, have so far been recorded from the Edinburgh Garden, the vast majority of them, though not all, on the HRS Edinburgh list. All are widespread species such as marmalade hoverfly (Fig. 3) but many have not been recorded in Edinburgh (according to the HRS website) for over ten years, so the city appears to be under-recorded. An example of this under-recording is *Volucella bombylans*, a distinctive, easily identified bumblebee mimic, which is not listed for Edinburgh on the HRS site but was recorded at RBGE in 2010 and 2011.

	Species	Years recorded		Species	Years recorded
1	<i>Anasimyia lineata</i>	09	28	<i>Melangyna cincta</i>	09
2	<i>Arctophila superbiens</i>	09, 11	29	<i>Melanostoma mellinum</i>	09–12
3	<i>Baccha elongata</i>	09, 10	30	<i>Melanostoma scalare</i>	09–11
4	<i>Cheilosia</i> aff. <i>fraterna</i>	10	31	<i>Merodon equestris</i>	09–11; vars <i>equestris</i> , <i>bulborum</i> , <i>narcissi</i>
5	<i>Cheilosia</i> aff. <i>pagana</i>	11, 12	32	<i>Myathropa florea</i>	09–11
6	<i>Cheilosia variabilis</i>	09	33	<i>Parhelophilus versicolor</i>	11
7	<i>Criorhina berberina</i> f. <i>oxyacanthae</i>	09	34	<i>Pipiza noctiluca</i>	09
8	<i>Dasysyrphus albostrigatus</i>	09	35	<i>Platycheirus albimanus</i>	09–11
9	<i>Dasysyrphus</i> cf. <i>pinastri</i>	09	36	<i>Platycheirus angustatus</i>	10
10	<i>Dasysyrphus</i> cf. <i>tricinctus</i>	09	37	<i>Platycheirus peltatus</i>	11
11	<i>Dasysyrphus venustus</i>	10, 11	38	<i>Platycheirus scambus</i>	09
12	<i>Epistrophe eligans</i>	09	39	<i>Platycheirus scutatus</i>	10, 11
13	<i>Epistrophe grossulariae</i>	09, 10	40	<i>Scaeva pyrastris</i>	11
14	<i>Episyrphus balteatus</i>	09–12	41	<i>Sericomyia silentis</i>	10
15	<i>Eristalis abusivus</i>	09, 11	42	<i>Sphaerophoria fatarum</i>	09, 10
16	<i>Eristalis arbustorum</i>	09, 11	43	<i>Sphaerophoria interrupta</i>	11
17	<i>Eristalis horticola</i>	09	44	<i>Sphaerophoria philanthus</i>	09
18	<i>Eristalis interruptus</i>	09, 11	45	<i>Sphaerophoria scripta</i>	09–11
19	<i>Eristalis intricarius</i>	09–12	46	<i>Syrpita pipiens</i>	09
20	<i>Eristalis pertinax</i>	09–11	47	<i>Syrphus ribesii</i>	09–11
21	<i>Eristalis tenax</i>	09–12	48	<i>Syrphus torvus</i>	10, 11
22	<i>Eupeodes corollae</i>	09–11	49	<i>Syrphus vitripennis</i>	09–11
23	<i>Eupeodes latifasciatus</i>	09	50	<i>Volucella bombylans</i>	10 (f. <i>plumata</i> ), 11
24	<i>Eupeodes luniger</i>	09–11	51	<i>Volucella pellucens</i>	09–11
25	<i>Helophilus hybridus</i>	09–11	52	<i>Xylota segnis</i>	10
26	<i>Helophilus pendulus</i>	09–11			
27	<i>Leucozona lucorum</i>	09, 10			

Table 6 Hoverflies (Syrphidae) recorded at RBGE's Edinburgh Garden, 2009–2011 (including first records of 2012 season). None is Listed.

*Odonata (2005–2011: Table 7)*

So far three dragonflies and four damselflies have been recorded. The most commonly seen are azure damselfly (an annual species, particularly favouring the small pond in the Scottish Heath Garden), and common hawkler. The other five species listed in Table 7 are recorded less frequently. In 2011 a decision was taken to manage the Scottish Heath Garden pond to encourage its use by Odonata.

	Common name	Scientific name	Family	Years recorded
1	Azure damselfly	<i>Coenagrion puella</i>	Coenagrionidae	pre-2008, 08–11
2	Blue-tailed damselfly	<i>Ischnura elegans</i>	Coenagrionidae	pre-2008, 11
3	Common blue damselfly	<i>Enallagma cyathigerum</i>	Coenagrionidae	pre-2008
4	Large red damselfly	<i>Pyrrhosoma nymphula</i>	Coenagrionidae	pre-2008, 09
5	Common hawkler	<i>Aeshna juncea</i>	Aeshnidae	pre-2008, 08–10
6	Black darter	<i>Sympetrum danae</i>	Libellulidae	pre-2008
7	Common darter	<i>Sympetrum striolatum</i>	Libellulidae	pre-2008

Table 7 Odonata (dragonflies and damselflies) recorded at RBGE's Edinburgh Garden, 2008–2011. None is Listed.

*Other insects (Table 8)*

The 11 beetle species so far recorded at RBGE include 3 species of ladybird (two-spot, seven-spot and pine) and 8 others such as green leaf weevil (Fig. 4). The alien harlequin ladybird, *Harmonia axyridis*, does not yet appear to have been found at RBGE – a photograph on Flickr taken in RBGE (DFG Photography, 2011) captioned as the species instead shows a melanistic two-spot ladybird, a variant I have seen myself in RBGE alongside the typical red form of that species.

Twenty-six fly species (including leaf-miners) have so far been recorded at RBGE. They include the rather scarce greater bee-fly, which can be seen hovering in front of plants in the Rock Garden in April and May; the St Mark's fly, vast hordes of which thronged the Garden in 2011; and some very attractive small 'picture-winged' fruit flies such as *Campiglossa misella* and *Euleia heraclei*. The nine bugs that have been recorded include four shield bugs, the alder spittlebug, the ubiquitous meadow froghopper and the pond skater. One lacewing has been recorded. Unusually this was the black lacewing (Fig. 5), recorded in June 2011 and only the fifth Scottish record of the species. A full report of this finding will be published elsewhere. Another notable discovery was of the barkfly *Trichopsocus brincki* on *Pinus strobus* in 2007 by Bob Saville (Saville *et al.*, 2008) – the first Scottish record of this nationally scarce species.



	Common name	Scientific name	Family	Order	Years recorded
1	a soldier beetle	<i>Cantharis livida</i>	Cantharidae	Col	10
2	a soldier beetle	<i>Cantharis nigricans</i>	Cantharidae	Col	11
3	Common red soldier beetle	<i>Rhagozycha fulva</i>	Cantharidae	Col	09–11
4	a leaf beetle	<i>Phratora</i> cf. <i>laticollis</i>	Chrysomelidae	Col	11
5	Two-spot ladybird	<i>Adalia bipunctata</i>	Coccinellidae	Col	11
6	Seven-spot ladybird	<i>Coccinella septempunctata</i>	Coccinellidae	Col	09–11
7	Pine ladybird	<i>Exochomus quadripustulatus</i>	Coccinellidae	Col	10, 11
8	Green leaf weevil	<i>Phyllobius maculicornis</i>	Curculionidae	Col	11
9	Common pollen beetle	<i>Meligethes aeneus</i>	Nitidulidae	Col	10
10	Bee beetle	<i>Trichius fasciatus</i>	Scarabaeidae	Col	09
11	Rose chafer	<i>Cetonia aurata</i>	Scarabaeidae	Col	10
12	a leaf-mining fly	<i>Aulagromyza cornigera</i>	Agromyzidae	Dip	11
13	a leaf-mining fly	<i>Phytomyza heracleana</i>	Agromyzidae	Dip	11
14	a leaf-mining fly	<i>Phytomyza ilicis</i>	Agromyzidae	Dip	11
15	a leaf-mining fly	<i>Phytomyza pastinacae</i> / <i>sphondylia</i>	Agromyzidae	Dip	11
16	St Mark's fly	<i>Bibio marci</i>	Bibionidae	Dip	10, 11
17	Greater bee-fly	<i>Bombylius major</i>	Bombyliidae	Dip	10, 11, 12
18	Bluebottle	<i>Calliphora vomitoria</i>	Calliphoridae	Dip	10, 11
19	Greenbottle	<i>Lucilia</i> sp.	Calliphoridae	Dip	09–11
20	a gall-forming fly	<i>Anisostephus betulinus</i>	Cecidomyiidae	Dip	11
21	a conopid fly	<i>Conops quadrifasciatus</i>	Conopidae	Dip	10
22	a fly	<i>Gymnopternus</i> cf. <i>cupreus</i>	Dolichopodidae	Dip	11
23	a fly	<i>Coenosia agromyzina</i>	Muscidae	Dip	10
24	a fly	<i>Eudasyphora cyanicolor</i>	Muscidae	Dip	11
25	House fly	<i>Musca domestica</i>	Muscidae	Dip	09–12
26	a fly	<i>Mydaea</i> cf. <i>affinis</i>	Muscidae	Dip	11
27	a fly	<i>Polietes lardarius</i>	Muscidae	Dip	09
28	a flutter-wing fly	<i>Palloptera quinquemaculata</i>	Pallopteridae	Dip	11
29	a flesh-fly	<i>Sarcophaga</i> sp.	Sarcophagidae	Dip	11
30	a midge	<i>Reichertella geniculata</i>	Scatopsidae	Dip	11

	Common name	Scientific name	Family	Order	Years recorded
31	Scarce orange legionnaire	<i>Beris clavipes</i>	Stratiomyidae	Dip	11
32	a soldier fly	<i>Chloromyia formosa</i>	Stratiomyidae	Dip	11
33	a parasitic fly	<i>Tachina fera</i>	Tachinidae	Dip	09–11
34	a fruit fly	<i>Campiglossa misella</i>	Tephritidae	Dip	10
35	a fruit fly	<i>Euleia heraclei</i>	Tephritidae	Dip	11
36	Crane-fly sp.	<i>Tipula</i> sp.	Tipulidae	Dip	10
37	Winter gnat	<i>Trichocera</i> sp.	Trichoceridae	Dip	11, 12
38	Hawthorn shieldbug	<i>Acanthosoma haemorrhoidale</i>	Acanthosomatidae	Hem	11
39	Birch shieldbug	<i>Elasmostethus interstinctus</i>	Acanthosomatidae	Hem	10, 11
40	Alder spittlebug	<i>Aphrophora alni</i>	Aphrophoridae	Hem	11
41	Meadow froghopper	<i>Philaenus spumarius</i>	Aphrophoridae	Hem	11
42	Pond skater	<i>Gerris lacustris</i>	Gerridae	Hem	09–11
43	Black-kneed capsid	<i>Blepharidopterus angulatus</i>	Miridae	Hem	11
44	a mirid bug	<i>Psallus</i> cf. <i>varians</i>	Miridae	Hem	11
45	Sloe bug	<i>Dolycoris baccarum</i>	Pentatomidae	Hem	11
46	Forest bug	<i>Pentatoma rufipes</i>	Pentatomidae	Hem	10, 11
47	a barkfly	<i>Trichopsocus brincki</i>	Trichopsocidae	Pso	07
48	Black lacewing	<i>Nothochrysa capitata</i>	Chrysopidae	Neu	11

Table 8 Miscellaneous other insects recorded at RBGE's Edinburgh Garden, 2009–2011. None is Listed. Orders: Col: Coleoptera; Dip: Diptera; Hem: Hemiptera; Neu: Neuroptera; Pso: Psocoptera.

### Spiders and gall mites (2011–)

Recording of these has only just begun but already at least eight gall-forming mites and five spiders have been recorded. The latter include the bright green cucumber spider (*Araniella cucurbitina*) and the zebra spider (*Salticus scenicus*), which is a jumping species. The exotic jumping species *Hasarius adansoni* (Fig. 6) was re-found in December 2011 in one of the glasshouses. The same species had been recorded from RBGE's glasshouses by W. Edgar Evans in 1904 (Carpenter & Evans, 1906) and by Robert Godfrey in 1905 (Pickard-Cambridge, 1906).



Fig. 1 *Platyptilia pallidactyla* (yarrow plume), 21 July 2011. Photo: Robert Mill.



Fig. 2 *Anthidium manicatum* (wool carder bee), 3 August 2011. First record for the Lothians. Photo: Robert Mill.

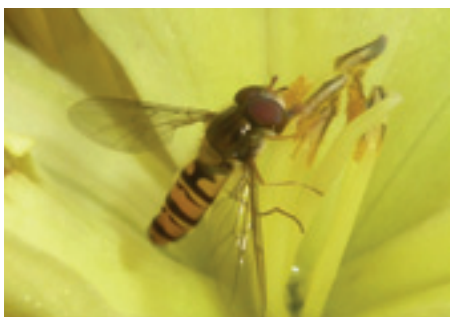


Fig. 3 *Epsirphus balteatus* (marmalade hoverfly), 3 August 2011. Photo: Robert Mill.



Fig. 4 *Phyllobius maculicornis* (green leaf weevil), 30 May 2011. Photo: Robert Mill.



Fig. 5 *Nothochrysa capitata* (black lacewing), 22 June 2011. Fifth record for Scotland. Photo: Robert Mill.



Fig. 6 *Hasarius adansoni*, on a *Begonia* leaf, December 2011. Re-discovered in the glasshouses after 108 years. Photo: Lynsey Wilson.

*Zooplankton (2010)*

Zooplankton were sampled by Ian Duggan in two of the outdoor ponds and the ponds in the Plants and People and Rainforest Riches glasshouses. Twelve rotifers, five cladocerans and one copepod, together with rotifer and copepod larval stages, were identified.

## CONCLUSIONS

Recording the wildlife of RBGE's Edinburgh Garden has yielded much new information, including several new records for the Lothians and a major range extension within Scotland for wool carder bee. Much remains to be done, particularly in less well-known groups that are difficult to identify and where there are few experts. Jennifer Owen recorded 2,199 wildlife species in her Leicestershire garden over 30 years, including 1,997 insects and 138 other invertebrates (Owen, 2010); compared with that total the Edinburgh figure, for a much larger garden, is very small but probably reflects both habitat differences and under- or non-recording of many groups. The RBGE Biodiversity Group is planning to hold a 'BioBlitz' event in 2013 that should address some of these issues by gathering together a wide range of experts and engaging the public. A BioBlitz is the intensive surveying of the biodiversity of an area over a 24-hour period. It is also proposed to compile biodiversity inventories for the other three botanic gardens managed by RBGE at Benmore, Dawyck and Logan. This will be a difficult task because of the lack of experts on the ground. Organising BioBlitzes at each Garden over a period of years could, however, greatly assist in increasing our as yet scant knowledge of the wildlife of those three places, currently limited to lists of birds, mammals and amphibians plus a short moth list for Logan.

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