

Mayo Large Carder Bee Study

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An tSeirbhís Páirceanna Náisiúnta
agus Fiadhúlra
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TIONSCADAL GEOPHÁIRC
Dhúiche Sheoigheach
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JOYCE COUNTRY & WESTERN LAKES GEOPARK PROJECT

Improving Botanical and Pollinator Recording around inland habitats of *Bombus muscorum* in the Mayo /North Galway area

Introduction: Status of *Bombus muscorum* populations across the British Isles

The recent Northern Ireland native bees survey (Threatened Bee Species, 2019) concurs with the 2007 Irish Regional Red List survey that loss of hay meadow habitat has been a key driver of ongoing decline in *Bombus muscorum* populations. Recent NBDC distribution maps show a pattern of predominantly coastal distributions, and it is on coastal urban centres that recent restoration efforts have been focussed (NBDC, 2022).

In *Bumblebees, Behaviour, Ecology and Conservation* (2010) Dave Goulson made a dietary distinction between moorland (Ericaceae) and grassland (Fabaceae) *B.muscorum* populations. However he reported in a May 2022 web presentation for Sustainable Skerries (archived at sustainableskerries.com) that while some moorland populations remained, the last UK grassland population known to him had vanished from Salisbury Plain.

On the other hand, the current Protecting Farmland Pollinators EIP project, working with pollinator-friendly farms in SE Ireland, has picked up the species on transects in three of its 40 sites (Saorla Kavanagh, pers. comm. May 2023) and it has been recorded from a further farm in the scheme (Mireille McCall, pers. comm. May 2023.)

My own relationship with grassland large carders began with misrecognition, and I suspect that may not be untypical. Until I submitted an image to Tomas Murray at NBDC in Spring 2018 for checking, I had not associated the small batch of later emerging paler-coloured “Carder Queens” frequenting my low-lying grassland site with the brightly coloured fresh Summer bumbles I occasionally encountered in wilder damp heath areas (Ballycroy, Achill Island.) They have continued to appear reliably here, always in small numbers. In 2023 three queens were present, at least one of which founded a successful colony on my land, while another may have settled in the adjacent townland. The last drone sighting this year was in late September, three weeks earlier than in 2022, while the first queen sighting was also three weeks earlier, on April 26th.

Two major questions, then, informed this Summer’s small investigation: Are there still viable grassland *B.muscorum* populations in the rural mid-West? Is their continuing decline inevitable?

Survey Focus: Meeting the Species' Forage Requirements

An approach that seemed feasible within the scope of a small qualitative survey was to locate potential habitat areas where forage plant communities were suited to the Large Carder's needs. However recent assessments of the species' forage preferences from different sources have been widely divergent. Of the top ten *B.muscorum* forage plants listed in the NBDC 2022 guide to Large Carder preservation only four appeared in Goulson's 2022 14-species list of favoured UK forage (Sustainable Skerries talk, May 2022), while two species which seem to be key to local Northwestern inland and coastal Large Carders, Bush Vetch (*Vicia sepium*) and Marsh Woundwort (*Stachys palustris*), do not figure in our national shortlist or Goulson's.

Foraging information is only an optional element in the NBDC casual sightings dataset, but that source is likely skewed by prevalent low levels of botanical species literacy (cf Stroud et al,2022). The Bumblebee Monitoring Scheme which forms the basis of the national trend analyses for bumble species does not routinely collect forage data.

The most relevant comparison dataset would seem to be the incidental 138 sightings of foraging *Bombus muscorum* from the 2022 Great Yellow Bumblebee EIP Project (data kindly provided by Dr Karina Dingerkus). Roughly half (49%) of these were on Fabaceae, though the total absence of knapweed sightings could have depressed the Asteraceae count. (*Hypochaeris* spp featured significantly at almost 14%, possibly as a substitute?)

Niamh Phelan's data from a Summer 2019 Master's thesis study of bumble foraging patterns on the Mullet peninsula suggested that *B.muscorum* shared with *B.distinguendus* a preference for flower-rich grassland over coastal grassland; the succession of dominant species in her flower-rich grassland analysis was red clover followed by knapweed.

Issues with assessing bumble forage preferences in the field

Aside from the occasional nature of the sightings that could be garnered by the current project, it would be unrealistic to infer a species' dietary preferences from situations of relative scarcity. What one is seeing is quite likely evidence of its flexibility or adaptability under challenge.

In an increasingly unstable climate, seasonal variations in growth and quality of different forage plants are likely to be a significant factor. For 2023, the poor March conditions followed by early summer drought delayed development of some important bumble forage species - *Vicia sepium*, *Succisa pratensis*; shortened the *Centaurea nigra* flowering season (as also the plants themselves on drier sites) while on some sites the later vetches, *Vicia cracca* and *Lathyrus*

pratensis barely flowered. On the other hand, the wet July-August weather likely influenced the profusion of *Lotus peduncularis* in September.

And as Lars Chittka's recent work on monitoring foraging patterns of individual bumbles, based on *Bombus terrestris*, has demonstrated, the choices involved in optimising a foraging route can be individual as well as complex.

A recent US study involving controlled rearing of *Bombus impatiens* queens (Watrous et al, 2019) has shown that their early life cycle pollen diet made a significant contribution to eventual nest productivity, with some forage genera providing better quality of nutrition than others. The authors' recommendation is for bumble queens to be exposed to a variety of pollen sources in the pre-hibernation and pre-laying stages. It seems reasonable to assume that this would also apply to our own native bumble species, and that criteria for a high-quality forage site should include variety of genera as well as abundance.

Survey Methods

With all these considerations in mind, I focussed my site visits on:

- i) known *B.muscorum* sites
- ii) other sites with fairly extensive communities of native plants (= >1/4 acre) including forage species relevant to bumblebees.

Following the NBDC's Great Yellow Bumblebee Guide, 2019, sites were generally located within roughly 10km of known sites.

Though many grassland quality indicator species were found on these sites they were not in the strict sense, species-rich grasslands. In assessing the potential significance of a site, continuity of flowering throughout the *B.muscorum* foraging season - late April to early October - was considered in addition to forage quantity and variety.

Abundance of the significant forage species present was estimated using the DAFOR scale (Walker et al, 2019). One issue that quickly arose was that due to persistent grazing or drought or both, useful forage species, most often common bird's foot trefoil, self-heal, creeping thyme, although extensive in the sward, were so stunted as to preclude development to flowering size in the current season. These were coded as Vestigial (V).

In all, 35 sites were recorded between the beginning of June and mid- September. The attached maps show the distribution of areas of moderate, good and high bumble forage potential identified.

Discussion: The Four Data Gathering Zones

Zone 1

This was both the most speculative and extensive, addressing the question of whether the recurrent sightings on my own land (Site 1/1) and close by (Site 1/2 - 2021, 2023) and occasional sightings on the local active turf bog (Site 1/7) were isolated instances, or represented a more extended population. It proved

to be the least productive. Some areas of moderate forage diversity investigated were impacted either by grazing (Iron Bridge lakeshore (1/6) or recurrent strimming Cullin N. Shore Beach - Site 1/8), while the only new area of high potential identified was around a deliberately sown “wildflower” meadow (Moy Angling Bank, Site 1/4) which over several years has come to be dominated by kidney vetch, ox-eye daisy, red clover, common bird’s foot trefoil and yarrow plus adjacent knapweed margins, supporting a good population of *B. Lucorum* agg, *B. pascuorum* and some *B. lapidarius*. A notable unexpected find here was a male Small Blue butterfly.

Particularly disappointing was the loss in ground flora diversity since 2020 in the Lough Conn/Ennisceoe Estate SAC (Site 1/9) - previously a moderately good area for observing bumbles - due to scrubbing up with alder.

Zone Two

Essentially this was an exploration of Lough Carra lakeside SAC areas, following on 2022 sightings of *Bombus muscorum* on the lakeshore near Moore Hall (Site 3) and in the 2-acre Walled Garden, (Site 4), which was sown with a commercial “Irish wildflower mix” in 2020, and is now dominated by pollinator-friendly native species. Both yielded good early-season *B. muscorum* sightings, though the shore flora is only moderate, while the Walled Garden is stronger on early flowering species than late.

Much of the Lough Carra shoreline is not readily accessible, but three additional flower-rich areas with good bumble populations were identified, and all of them yielded late season *B. muscorum* sightings. (Brownsto Pier - Site 2/7) , Kilkeeran Shore (Site 2/5) and an abandoned fodder radish field near Kilkeeran (Site 2/6).

Zone 3

Previous sightings on limestone pavement areas of Lough Mask’s southern shore (Roshill 2019, Castle Lake 2020, both repeated in 2022) suggested the possibility of a more widespread *B. muscorum* population. However, additional areas sampled in July to early August showed very poor forage development due to earlier severe drought, and in grassy areas also due to unrestricted grazing by sheep. *B. muscorum* observations in this zone were fewer than in 2022, with the exception of a couple of September sightings on Cong Dry Canal – a new location for the species.

Zone 4

A sighting of a *B. muscorum* queen on a pollinator-friendly town centre site in Ballinrobe September 2021 (Morley’s Garden Centre, 4/ 1 was followed by recurrent sightings from May 1 this year, suggesting an established colony. The adjacent grounds of a former convent, also managed for pollinators, have good bumble populations,³ and could well provide nesting or hibernating habitat for *B. muscorum* (Site 4/2). Explorations of a possible Ballinrobe hinterland / Lough Mask storage corridor were unfruitful.

A single speculative trip in late July to Glasrai, an organic vegetable farm near Hollymount (Site 4/3), was rewarded with the spectacle of a profuse and healthy pollinator population, particularly on a flowering green manure crop, while on a

pollinator-flower field-border I came across two *B.muscorum*, one of them a male. foraging on crimson clover, *Trifolium rubrum*.

Another outlier site assigned to this Southeastern group was a hay meadow in Carrantanlis, East Galway where *Bombus muscorum* was present in Spring 2022 (pers.comm., Colm Moriarty), Though my single visit on a rather windy July day did not yield a sighting, the area has key forage plants for both early and late seasons.

Survey Phase Outcomes

Forage Survey Data

Occurrence and relative abundance of significant forage species are recorded in spreadsheets 1-4, covering the four Zones. An overview of sites with moderate to good bumble forage is provided by the attached maps.

Large Carder Sightings

Given the irregular exploratory nature of the site visits, actual sightings were incidental. But in a poor season generally for bumbles, with the national scheme provisionally reporting lower than usual numbers and shorter colony duration, it was encouraging to find evidence of *B.muscorum* on five new sites, and of their persistence on five of six known sites. For three of these new sites, I was able to make a follow-up visit, and each of these yielded a confirmatory sighting.

Forage Choices

As the forage species counts from these sightings can be no more than indicative, they are arranged here by the number of sites where each species was observed in use.

FORAGE SPECIES	TOTAL of SITES
<i>Succisa pratensis</i> -	6
<i>Centaurea nigra</i> -	4
<i>Trifolium pratense</i> -	3
<i>Vicia Sepium</i> -	3
<i>Lotus peduncularis</i>	2
<i>Origanum vulgare</i>	1
<i>Stachys palustris</i>	1
<i>Cirsium dissectum</i>	1
Non-native and Cultivated Species - including Comfrey and <i>Trifolium rubrum</i>	3

Status of Sites

With two exceptions (Site 1/9, Site 3/9) the semi-natural sites where *Bombus muscorum* was observed were under some form of protection (SAC/SPA) or pollinator-friendly management.

In the wider area, forage-rich linear habitat (verges, hedgerows, etc) offering potential pollinator corridors was notably scarce.

Dissemination Workshops - Design

The community workshop combined hands-on experience collecting and identifying insect species with illustrated talks on two themes:

(i) Locally-occurring bumble species, their lifestyles, forage preferences by plant family, and the pressures on them, with particular reference to the Large Carder (including images and identification tips).

(ii) The role of citizen science as a means of sharing biodiversity observations with peers through the various Biodiversity Ireland schemes, or making discoveries from the data contributed by other observers.

A printed overview of key basic resources for studying and recording pollinators and native plants was provided to participants.

Loss of the L Conn teaching site had left room to respond to an emerging need for raising awareness of the Large Carder among those engaged in fieldwork for local projects, an alteration agreed with the Small Recorder Project managers at NPWS.

1. Wild Bees, Wildflowers and Citizen Scientists

August 19 Heritage Week family workshop, Carnacon / Moore Hall

With a ratio of six under-12s to four adults, the emphasis was on the field trip to Moore Hall Walled Garden, where the young people thoroughly enjoyed learning to handle nets and transfer their captures safely to magnifying bug pots. Their catch included grasshoppers, ladybirds and a common blue damselfly, as well as common carders, *Eristalis* hoverflies and one *Andrena* solitary bee.

2 Tracking Mayo's Under-recorded Pollinators: The case of the Large Carder

August 31 Location - as for 1 above.

This session was marginally oversubscribed, with representation from the Lough Carra LIFE project, the Joyce Country / Western Lakes Geopark Project, NPWS and the ACRES scheme, plus three community members. With this audience it was possible to include more detail on bumblebee sensory and learning capacities relevant to foraging behaviour, and on use of NBDC records for investigating as well as recording local biodiversity. The point about local under-recording was nicely demonstrated when a course member produced a phone picture of a Large Carder for ID confirmation, from a previously unknown mid-Mayo location on Annexe 1 grassland.

3. Wild Bees, Wildflowers and Citizen Scientists

September 10.

Community workshop for the Mayo/Galway border area Petersburg Outdoor Education Centre.

This session yielded the best results in recording terms, with sightings of *Eristalis intricaria* (last recorded in the area forty years ago), one *B.muscorum* male, and a wide range of flowering plant species including a number of key bumble forage plants. This was partly due to a small group size, with some local online bookings failing to materialise.

Training Outcomes

In all the sessions, immediate effects of increased awareness and engagement with preservation and recording issues were evident. The crucial outcomes of the training, however, knowledge transfer and shifts in practice will only be evidenced in coming seasons.

Conclusion: Next Steps to Protect Grassland Large Carders

1. Embedding good conservation practice at community level will depend on mobilising existing community networks through targetted training and support.
2. I would like to think that this Summer's small investigation has garnered enough evidence to justify further exploration of grassland *B muscorum* survival in semi-natural habitats in the Western Lakes area. But that could prove slow and resource - intensive. The best immediate route to improving knowledge and understanding is likely through integrating bumble and *B.muscorum* observation into existing rural habitat restoration projects.

At a minimum, closer-grained monitoring of this year's confirmed *B.muscorum* sites, especially in the early season, would be informative.

3. Pragmatically, though, the pace of *B.muscorum*'s decline would suggest making some targetted interventions to support local populations without waiting for research results. Hybrid environments, those including naturalised species favoured by longer-tongued bumbles (eg comfrey, *Symphytum uplandicum*) and selected crop- (eg the annual crimson clover) and cultivated-plants (eg scabious cultivars) alongside native plant areas could offer the quickest leverage for building up forage supplies and preserving localised *B.muscorum* populations. Discssions have already begun with three privately-owned hybrid sites in Zone 4.

4. In the longer term, however, any prospects of wider restoration in the Mayo/Galway landscape are likely to rest on the introduction of some phased grazing, along with improvements to linear habitat to establish biodiversity corridors.

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