The Glasgow Naturalist (online 2020) Volume 27, Part 2

https://doi.org/10.37208/tgn27220

New records of sessile earthstars (*Geastrum fimbriatum*) and collared earthstars (*Geastrum triplex*) from the Glasgow area, Scotland

M. O'Reilly

Scottish Environment Protection Agency, Angus Smith Building, 6 Parklands Avenue, Eurocentral, Holytown, North Lanarkshire ML1 4WQ

E-mail: myles.oreilly@sepa.org.uk

Earthstars are one of our more recognisable types of fungi due to the distinctive star-shaped structure of their fruiting body. They are gasteromycete fungi, a type of puffball, enclosed in a pericarp which splits and unfolds to form the characteristic star shape. They tend to grow in dry places: under bushes, on dunes, in litter in dry conifer woodland, dry grassland, and often in manmade habitats such as unused railway lines. Many are found under yew (*Taxus* spp.) in churchyards. The release of spores is caused by raindrops or disturbance tapping the spore sac (Watling, 1973; Pegler *et al*., 1995; Petersen & Læssøe, 2019).

Their apparent arrival and spread throughout the Glasgow area, Scotland, has been highlighted recently by McInerny (2019), who noted they were first recorded in 2004 and, according to the Glasgow Museums Recording Centre (GMRC), are now known from over 16 locations. These include Victoria Park, Kelvingrove Park, Kelvinbridge, Botanic Gardens, Bell Street, Springburn Park, Richmond Park, Bellahouston Park, Pollok Park, King's Park and Muirend. Many of the finds have been by members of the Clyde and Argyll Fungus Group (CAFG) who have undertaken numerous fungal surveys in and around the Glasgow area since 2010. Most of the records are for the collared earthstar (*Geastrum triplex*) one of the most frequent of the 18 earthstar species known from Britain and Ireland (Pegler *et al*., 1995; Buczacki *et al*., 2012). Collared earthstars are characterised by the development of a collar around the spore sac as the pericarp rays reflex and split when the earthstar matures (Fig. 1). As noted by O'Reilly (2011), a well-defined white halo encircles the spore sac aperture of *G. triplex* allowing identification of immature specimens without collars (Fig. 2).

However, another earthstar species has also been reported recently from the Glasgow area. In August 2014, the sessile earthstar (*Geastrum fimbriatum*) was photographed in Queen's Park by John McOwat, a local naturalist, and the photos forwarded to GNHS. Unfortunately no details of the precise location in Queen's Park were provided so the *G. fimbriatum* site could not be revisited. The following May, a further find of old specimens of *G. fimbriatum* was made by Mr McOwat at Strathclyde Country Park, North Lanarkshire, by the Clyde Walkway, just south of the A723 bridge (NS737561).

Fig. 1. Mature collared earthstars (*Geastrum triplex*), around 10 cm diameter, showing cracking of pericarp to form a saucer-like collar; Pollok Park, Glasgow, Scotland, October 2019. (Photo: M. O'Reilly)

Fig. 2. Immature collared earthstars (*Geastrum triplex*), around 10 cm diameter, without collar but showing distinct spore sac halo; Pollok Park, Glasgow, Scotland, October 2018. (Photo: M. O'Reilly)

Although CAFG had undertaken a fungus foray in Queen's Park in November 2013, no earthstars were recorded. However, on 24th August 2019, CAFG carried out another fungus foray and on this occasion sessile earthstars were discovered on the northern side of the park in a small patch of wood between the bandstand and the drive-through road (NS5801362186). Approximately 25 specimens were counted within an area of leaf litter around 3 m^2, at the base of an alder (*Alnus glutinosa*) and partly concealed beneath an evergreen bush. The *G. fimbriatum* specimens look quite similar to *G. triplex* but the reflexing pericarp rays

do not split to form a collar in mature specimens and they lack the distinct spore sac halo (Figs. 3, 4).

Fig. 3. Mature sessile earthstars (*Geastrum fimbriatum*), around 6 cm diameter, part lateral view showing reflexed pericarp; Queen's Park, Glasgow, Scotland, August 2019. (Photo: M. O'Reilly)

Fig. 4. Mature sessile earthstars (*Geastrum fimbriatum*), around 6 cm diameter, showing lack of spore sac halo; Queen's Park, Glasgow, Scotland, August 2019. (Photo: M. O'Reilly)

Thirteen of the *G. fimbriatum* specimens were subsequently measured. The maximum spread of the pericarp rays was 4.5-9.0 cm (mean 6.5 cm), and the diameter of the spore sac was 2.0-3.0 cm (mean 2.4 cm). Hence the largest *G. fimbriatum* overlap with the size range of 7-10 cm quoted by Buczacki *et al*. (2012) for *G. triplex* and immature individuals of these two species could be confused. However, the characters cited above are usually sufficient to distinguish *G. fimbriatum*. Fortunately both species normally occur in groups allowing a range of specimens to be examined.

Just a few days later, on 28th August 2019, another site in Queen's Park site was checked, near Camphill House (NS57626217). This was where giant puffballs had been seen previously (O'Reilly, 2018). Although no puffballs were observed this time, ten unopened earthstars were discovered. These resemble plant bulbs protruding from the leaf litter and are usually quite difficult to spot (see Fig. 1 in McInerny, 2019). The earthstar "bulbs" did not open until a month later revealing them to be the first record of *G. triplex* from the park. On that same day (23rd September 2019) shortly after leaving the park and while waiting in a traffic queue on Langside Drive, the author noticed another new colony of earthstars on a shady bank next to the Langside Station (NS5741460995). On closer examination these also proved to be *G. triplex* with a total of 31 earthstars spread over the embankment.

Whilst some earthstars may be camouflaged or concealed by leaf litter, once the fruiting bodies are opened they may be quite conspicuous with the paler rays contrasting somewhat with the surrounding leaf litter or bare earth. They are quite persistent and may last several months, enabling them to be observed and counted long after their initial appearance. Over recent years the author has re-visited some of the collared earthstar sites in Glasgow and undertaken counts. A total of 15 counts have been made at five different locations (Table 1). At most sites the earthstar groups were found within a radius of just a few square metres, although in Victoria Park they were spread a little further and at Muirend they were stretched about 50 m along the length of a hedgerow. The abundance at sites ranged from five to 50 earthstars. It is evident from even these few observations that the colonies are long lived with earthstars reappearing in the same location year after year. The earthstars at Bellahouston and Kelvinbridge appear to have lasted at least six years, whilst those in Pollok Park are still going strong at the same spot after ten years.

Although the collared earthstar is apparently becoming commonplace around Glasgow, the sessile earthstar is still a relative rarity. The National Biodiversity Atlas shows only nine occurrences for *G. fimbriatum* in Scotland, mostly old records, scattered over the Lothians, Renfrewshire and Ayrshire, and a single record near Tayport, Fife (NBN, 2020). A review of records in the Fungal Records Database of Britain and Ireland adds only one other Scottish site near Perth, Perth and Kinross (FRDBI, 2020). However, there are several hundred records across the U.K. and the basidiomycete checklist describes it as occasional but widespread in the British Isles, associated with nine broadleaf and seven conifer tree taxa (Legon & Henrici, 2020). It is not clear why earthstars seem to have appeared and spread in the Glasgow area.

Location	NGR	Date	Count
Victoria Park	NS54056728	29/09/2017	25
Victoria Park	"	28/12/2018	40
Kelvinbridge	NS57486700	06/09/2019	50
Kelvinbridge	"	10/08/2014	15
Kelvinbridge	"	13/01/2019	34
Kelvinbridge	"	09/09/2019	20
Bellahouston Park	NS55266387	25/10/2014	5
Bellahouston Park	"	05/09/2019	14
Pollok Park	NS55236621	07/11/2010	11
Pollok Park	"	30/10/2011	8
Pollok Park	"	12/10/2016	23
Pollok Park	"	21/10/2018	10
Pollok Park	"	05/09/2019	22
Muirend	NS57205967	13/11/2016	28
Muirend	"	13/10/2019	10

Table 1. Collared earthstar (*Geastrum triplex*) counts at five selected locations around Glasgow, Scotland. For intervening years without counts no site visit was made. Note the counts at Victoria Park in December and Kelvinbridge in January represent old specimens from the previous autumn.

The fungi of Glasgow's parks have been well studied in the past (Marshall, 1979) so it seems unlikely that such a distinctive species would have been overlooked. The extensive use of bark mulches may possibly play a role or perhaps climate change could be involved, but more detailed studies would be needed to help understand fungal distribution changes. It is hoped that raising awareness of these interesting fungi will encourage naturalists to look out for further records and perhaps additional earthstar species will be found in the area.

Determination of other species will require careful examination. Confusion could arise with the crowned earthstar *G. coronatum* and the rosy earthstar *G. rufescens* and the two species described here. The colour of the gleba (spores and sac contents) is different in all species, as is the size and ornamentation of the spores. Overall size is very variable in all species, and several species, including *G. fimbriatum*, can occasionally crack to produce collars. As many earthstars are rare and some are red listed, collection of specimens should be avoided, and *in situ* examination (and photography) is recommended for identification purposes. Recent genetic studies indicate that several European earthstar species, including *G. triplex*, may be hiding unrecognised cryptic species (Kasuya *et al*., 2012; Jeppson *et al*., 2013).

Thanks are due to Richard Weddle for providing GMBRC records, Dick Peebles for leading the CAFG forays and to Stephen Mitchell for finding the sessile earthstars in Queen's Park in 2019. Thanks also to an anonymous reviewer for improvements to the text.

REFERENCES

Buczacki, S., Shields, C., & Ovenden, D. (2012). *Collins Fungi Guide. The Most Complete Guide to the Mushrooms & Toadstools of Britain & Ireland.* Harper Collins Publishers, London.

FRDBI (2020). *Fungal Records Database of Britain and Ireland*. http://www.frdbi.info/ Accessed 21st January 2020.

Jeppson, M., Henrik Nilsson, R. & Larsson, E. (2013). European earthstars in Geastraceae (Geastrales, Phallomycetidae) – a systematic approach using morphology and molecular sequence data. *Systematics and Biodiversity* 11, 437-465. https://doi.org/10.1080/14772000.2013.857367

Kasuya, T., Hosaka, K., Uno, K. & Kakishima, M. (2012). Phylogenetic placement of *Geastrum melanocephalum* and polyphyly of *Geastrum triplex*. *Mycoscience* 53, 411–426. https://doi.org/10.1007/S10267-012-0186-Z

Legon, N.W. & Henrici, A. (2020). Checklist of the British & Irish Basidiomycota. Royal Botanic Gardens, Kew. http://basidiochecklist.science.kew.org Accessed 17th February 2020.

Marshall, M. (1979). *Fungi of the Glasgow Parks.* Glasgow District Council. [Erroneously cited as published in 1952 by O'Reilly (2018)]

McInerny, C.J. (2019). The collared earthstar in the Glasgow area, Scotland. *The Glasgow Naturalist* 27(1), 73-75.

NBN (2020). *National Biodiversity Atlas, Scotland.* https://scotland-species.nbnatlas.org/species/NBNSYS0000041523 Accessed 21st January 2020.

O'Reilly, M. (2018). Giant puffballs in Queen's Park, Glasgow. *The Glasgow Naturalist* 26(4), 94-96.

O'Reilly, P. (2011). *Fascinated by Fungi: Exploring the Majesty and Mystery, Facts and Fantasy of the Quirkiest Kingdom on Earth*. First Nature, Llandysul, Wales.

Pegler, D.N., Læssøe T. & Spooner, B.M. (1995). *British Puffballs, Earthstars, and Stinkhorns. An*

account of the British Gasteroid Fungi. Royal Botanic Gardens, Kew, London.
Petersen, J.H. & Læssøe, T. (2019). *Fungi of Temperate Europe*. Princeton University Press.
Watling, R. (1973). *Identification of the Larger Fungi*. Hulton Group Keys. Hulton Educational Publications Ltd., Amersham, Bucks. https://doi.org/10.5962/bhl.title.106851