

1. The Discovery Curve

In botanical recording, winter is mostly a time for analysis and reflection (although some hardy souls continue to collect data on New Year's day). With the Urban Flora project, we still need more data before analysis can begin in earnest. An important question is: how many species might be 'out there' which we haven't yet seen? To answer this, we can look at the relation between the number of records made and the number of species found. The relationship is an example of the 'law of diminishing returns' whereby the more you search the more difficult it becomes to find new items. Scholars applied mathematics to the problem in the 1970s to estimate the number of words in Shakespeare's vocabulary. As one works one's way through the plays, new words become progressively harder to find. Just like flowers. I thought it would be interesting to apply the concept to the Urban Flora data set (before 2014 - mid 2018).

It was gratifying to see that the data do fall onto a smooth curve, 'the discovery curve' I call it. I fitted this curve using the Michaelis-Menten equation first encountered in my undergraduate biochemistry class, named after the German chemist Leonor Michaelis and the Canadian physician Maud Menten. The software I used provides an estimate of the asymptote i.e. the number of species that are expected after a very large (infinite) amount of searching. The answer was 1616 ± 23 . So far we've found only 1,200 of them. After filtering the data to exclude cryptograms the total number of vascular plants from urban sites was 1396 ± 58 . We are thinking of testing the predictions further, using the huge data set from the BSBI database. Roger West is interested in the related question of how many towns do we need and how to sample them systematically.

In December I happened to meet Ken Thompson, a friend who has done the same thing with his survey of biodiversity of gardens in Sheffield. He tells me that there was a striking difference between the result of the analysis of native and alien species. That is something we must look at in our own data.

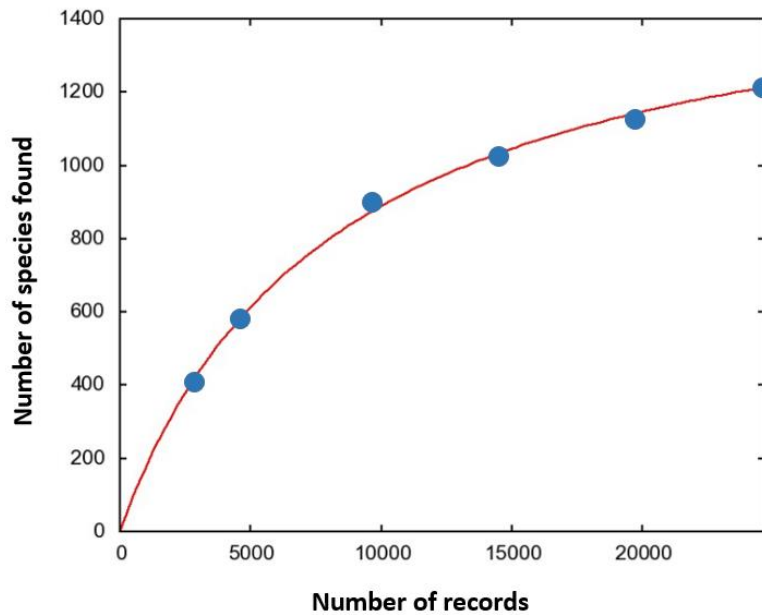


Fig. 1. The 'discovery curve', shown as the relation between the recording effort (number of records) and the number of species found.

2. The Piri Piri Burr *Acaena novae-zelandiae*

We found this little plant at Melrose, in the woods by the river Tweed. It is a prostrate perennial with a woody base, forming stolons, and well known as an alien from New Zealand and SE Australia, coming over with imported fleeces (Gynn & Richards 1985). Our initial thought was that it had escaped from a nearby garden, as we saw it there too. However, it has been pointed out that it may well be a relic of the original population of wool aliens. It certainly has increased since the report by Gynn & Richards, when there were no Scottish records at all and only a few in England, most in the NE corner of England and concentrated almost as an infestation on Lindisfarne, the Holy Island. Now there are many records (Fig. 2). The fruits have barbed spines and the species may well have been dispersed on the shaggy coats of dogs as Glynn & Richards suggested. For some time, Thompson & Morgan the seed merchants were selling it, and it can sometimes be seen at garden centres, even though it is nowadays recognised as an invasive plant, especially in coastal areas where it could threaten native species.

This raises questions about the extent to which wool aliens have persisted in our Scottish flora. Most may have died out, suffering from cold winters or dry summers. We should look into this matter, perhaps starting from the original work of Hayward and Druce (1919) and Lousley's BSBI note: *Census List of Wool Aliens found in Britain 1946-1960*.

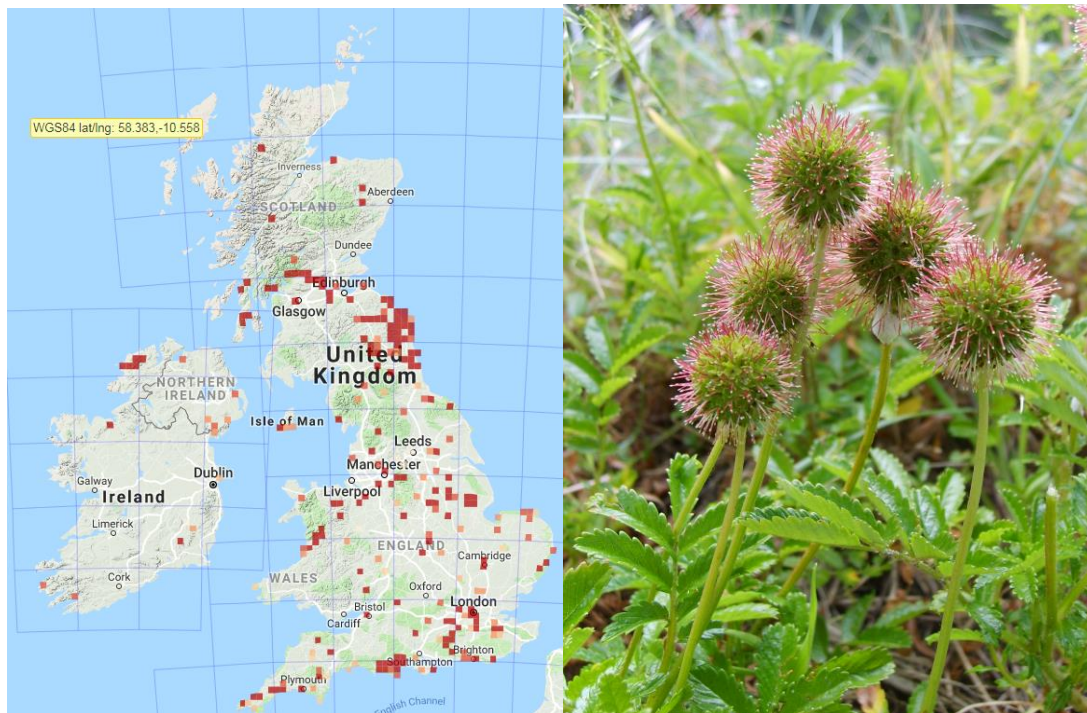


Fig. 2. Current distribution of *Acaena novae-zelandiae*, BSBI Atlas January 2019.

3. Example of climatological correlations: Prickly lettuce, *Lactuca serriola*,

If we want to see climatological relationships of species we should look not at aliens, but at native species, or at least those which have been around long enough to have formed an equilibrium with the climate. I heard that the Prickly Lettuce, *Lactuca serriola*, has been cropping up in Glasgow. Dickson's *The Changing Flora of Glasgow*, published in 2000, describes it as 'very rare'. If we look at the current distribution, it is still rare in Scotland (Fig. 3). However, it shows almost exact correspondence to the mean summer temperature. As summers get warmer, we can expect to see more of it. Have you seen it?

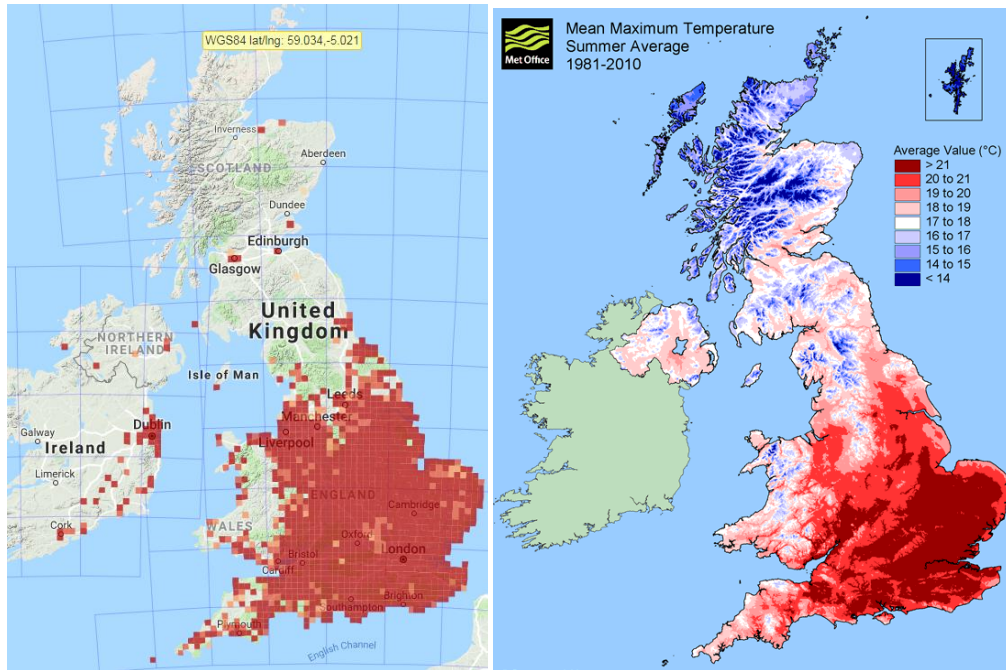


Fig. 3. Distribution of *Lactuca serriola*, Prickly lettuce, and the distribution of summer temperatures.

4. Plans for the 2019 field season

The field season will soon be upon us, and the programme of field visits is being prepared. We hope to explore towns in Dumfries and Galloway, as well as making some more local visits to allotments and a survey of Edinburgh's tramline. I do hope you will be able to join us.