Botanical Society of Britain & Ireland

New Year Plant Hunt 2022

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Montage of plants spotted in Cornwall during the 2022 New Year Plant Hunt
Image courtesy of Dan Ryan

Summary

- The BSBI's eleventh New Year Plant Hunt (NYPH) took place between Saturday 1st and Tuesday 4th January 2022. Volunteers submitted lists of native and non-native plants they found in bloom in the wild during a three-hour walk at locations throughout Britain and Ireland. The results were submitted online via smartphones and other electronic devices.
- 1,895 recorders took part in 2022, submitting 20,612 records of 669 plant species in bloom on 1,256 lists. This total excludes six lists where Hunts had yielded no records of plants in flower.
- The four species most frequently recorded in flower in 2022, in rank order, were Daisy *Bellis perennis*, Dandelion *Taraxacum agg.*, Groundsel *Senecio vulgaris* and Annual Meadow-grass *Poa annua*.
- In 2022, as in previous years, more species were flowering late (53%) rather than early (25%), as opposed to 22% which would either be expected to flower at New Year or are typical 'all-year-rounders'.
- These proportions of species flowering early, late or as expected were similar to previous years, suggesting that the majority of plant species flowering out of season are 'autumn stragglers' that continue to flower in the winter due to mild weather.
- These proportions do not appear to change significantly from year to year although the overall numbers of plants in flower increase during milder winters, most notably in 2016 and 2021, and to a lesser extent 2015 and 2019, when temperatures were well above average in November and December.

Introduction

Since 2012, the Botanical Society of Britain & Ireland (BSBI) has run an annual hunt for plants in flower during a four-day period over New Year (Marsh, 2015, 2016; Walker & Marsh, 2017, 2018, 2019, 2020). Participation has grown steadily and for the past two years almost 2000 participants recorded lists of flowering plants from over 800 locations across Britain and Ireland (Walker & Marsh, 2019). A very similar scheme (Year End Plant Hunt), run by the Dutch botanical society (FLORON), has been running in The Netherlands since 2015 and has had a similar level of participation (Sparrius, 2019).

Originally the main aim of the New Year Plant Hunt (NYPH) was to provide a fun and engaging project for botanical enthusiasts during the quiet winter months. Ten years on it now also provides valuable insights into how many species normally flower during the winter and, along with initiatives such as the Woodland Trust's 'Nature's Calendar' project, it is helping to build up a picture of how our flora is responding to changing weather patterns as a consequence of climate change (Büntgen et al., 2022). Due to media coverage, NYPH is also raising the profile of the BSBI and introducing its work to new audiences as well as helping BSBI to introduce new technologies such as social media and online recording applications. Here we provide a brief summary of the results of the NYPH 2022.

Method

For NYPH 2022, volunteers picked a day between the 1st and the 4th of January 2022 and recorded all native and non-native plants, excluding obviously planted species in private and public gardens, that they found in flower on a walk not exceeding three hours, excluding breaks and time travelling between sites.

Participants were encouraged to restrict their hunts to a single area/site but in a few cases multiple sites were visited within the three-hour period (for example at stops along a motorway). In many cases recorders followed the same routes that they had taken in previous years. Participants were encouraged to check that plants were actually in flower and not just immature or seeding, for

example by checking that catkins were open, that grasses had open florets with stigmas or anthers etc. Conifers were included but all ferns and fern-allies were excluded from lists.

The majority of lists were submitted via a smartphone, tablet or PC, allowing the results to be viewed simultaneously as they came in (Fig. 1). This substantially increased the efficiency of data entry and reduced errors during data processing. Data validation prior to analysis included checking the completeness of the lists and that the site details submitted were correct, identifying unidentified species from photographs, checking doubtful records and that taxa matched those given by Stace (2010), and removing ferns and fern-allies and taxa identified to family or genus only. Subspecies and varieties (including colour variants, 'flora pleno', etc.) were aggregated to species-level as were microspecies of *Hieracium*, *Rubus* and *Taraxacum*. Aggregates were also used for closely related taxa that are generally not recorded consistently (e.g. *Arenaria leptoclados/serpyllifolia*, *Aphanes arvensis/australis*, *Galanthus* spp., *Galeopsis bifida/tetrahit*, *Hedera helix/hibernica*, *Polygonum aviculare*). Non-native crops with native subspecies (e.g. *Beta vulgaris*, *Brassica rapus*) were not usually differentiated for the purposes of analyses.

To allow an assessment of whether species were flowering early or late, species were allocated to one of three phenological categories based on their 'typical' flowering months which were collated from various sources. For this we used published flowering months given in Clapham et al. (1987) and Sell & Murrell (1996-2018). Species were categorised as flowering 'on time' if they normally flower at New Year (December-January); 'early' if the number of months from New Year to first flowering month is less than the number of months from the last flowering month to New Year; and 'late' if the number of months from the last flowering month to New Year is less than the number of months from New Year to the first flowering month. Where the number of months from the first and last flowering months to New Year were equal, species were classified as 'early or late'. For a number of non-natives, the normal flowering period was not known.

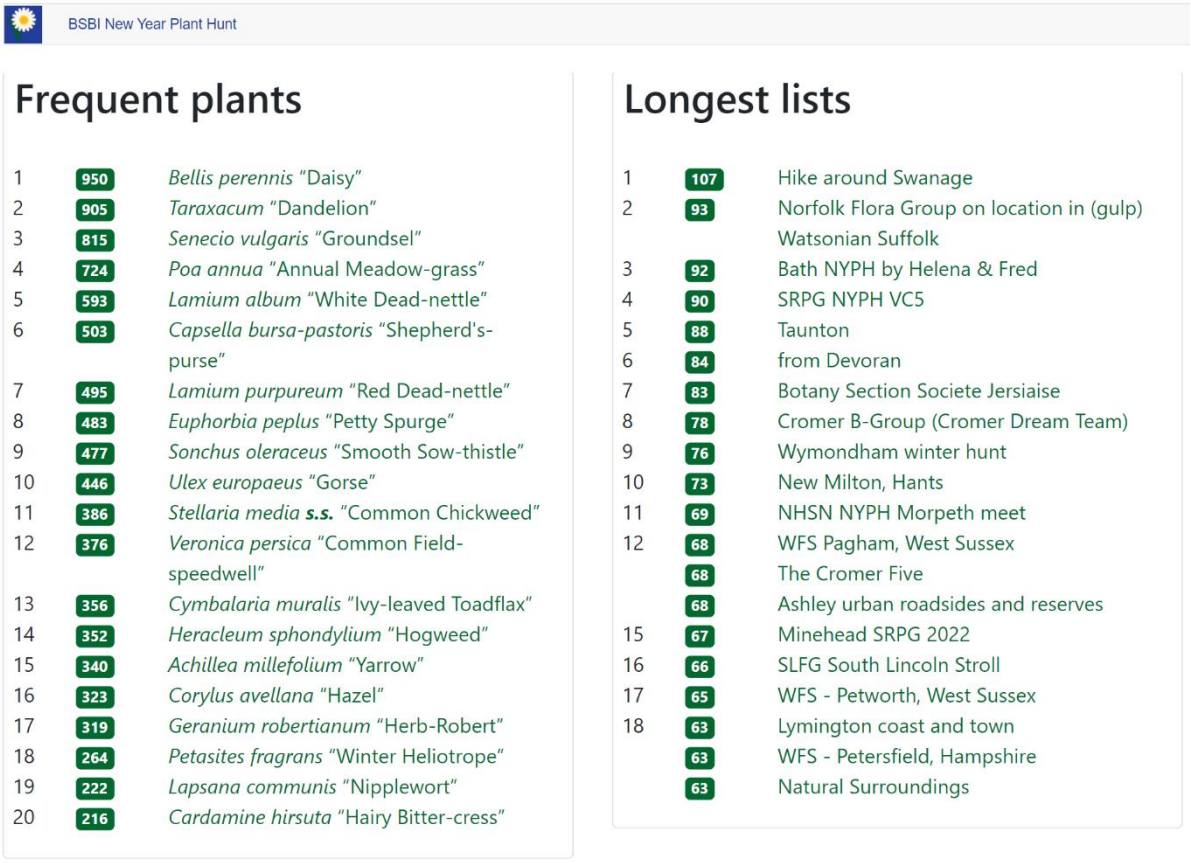

Figure 1. Output from the New Year Plant Hunt 2022 Results webpage: https://nyph.bsbi.org/results.php

Before the pandemic, organisers of local group hunts were encouraged to send details to the NYPH organisers so their events could be publicised on the BSBI website and via BSBI social media platforms. These group hunts often attracted large groups of plant hunters at all skill levels, from beginner to expert, who benefited from the plant identification advice on offer and enjoyed the social aspect of the NYPH. In 2021, government restrictions on social gatherings were imposed in response to the coronavirus; these restrictions varied across Britain, Ireland, the Channel Isles and the Isle of Man. As a result, no organised group hunts were advertised on the BSBI website and plant hunters were instructed to follow their local government guidance closely when planning their hunts. In 2022, some local flora groups opted to arrange group Hunts and promote them via their own social media platforms but these were not advertised on the BSBI website due to ongoing concerns around Covid-19.

Results

1,895 participants took part in 2022, submitting 20,612 records of 669 plant species in bloom on 1,256 lists. The total of 1,895 represents a 4.6% increase from the previous year (Table 1). 1,256 lists were submitted, an increase of 6% compared to 2021 and the highest number of lists ever submitted (Fig. 2). This total excludes 6 lists where plant hunters found no species in bloom. From these lists 20,612 unique records were used in the analysis, a small decrease of 3.8% compared to 2021. The number of lists submitted broken down by countries reveals changes, with high increases for England, Ireland, and the Channel Isles but decreases in Wales and Scotland; the Isle of Man has yielded no results from the previous two years (Table. 2).

From the unique records, 669 different species were recorded and the relative percentage of native and non-native is roughly even, as it has been in previous years (Table 3). Even though the number of species recorded is roughly even, the number of records shows that natives have been roughly two thirds of all of the records submitted since 2015 (Table 4).

Table 1. The number of individuals participating, Number of submitted lists, the number of records submitted in the New Year Plant Hunts, 2016-2022, with increase in percentage shown for 2022 in comparison to 2021.

	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**% change '21-'22**
Participants	405	416	>800	1471	1714	1811	1895	+4.6%
Lists	432	460	612	712	798	1185	1256	+6%
Records	9160	7123	9907	14193	14880	21419	20612	-3.8%

Table 2. The number of New Year Plant Hunt lists submitted 2016-2022 broken down by country, with percentage increase shown for 2022 in comparison to 2021.

Number of lists	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**% change '21-'22**
England	297	282	427	466	538	821	923	+12.42%
Wales	19	28	33	41	42	132	76	-42.4%
Scotland	64	43	56	94	102	138	122	-11.6%
Ireland	50	104	94	99	90	98	126	+28.6%
Channel Isles	2	3	2	6	7	6	9	+50%
Isle of Man	0	0	0	6	19	0	0	0%
Total	432	460	612	712	798	1185	1256	+5.9%

Table 3. The number of plant species recorded during the New Year Plant Hunt 2016-2022.

Number of species	2016	2017	2018	2019	2020	2021	2022
Native	313	264	291	327	322	379	315
Non-native	298	228	241	300	293	331	354
Total	611	492	532	627	615	710	669
% native	51	54	55	52	52	53	47
% non-native	49	46	45	48	48	47	53

Table 4. The number of individual records made during the New Year Plant Hunt 2016-2022.

Number of records	2016	2017	2017	2019	2020	2021	2022
Native	6210	4509	6376	9055	9521	13777	12284
Non-native	2950	2614	3531	5138	5359	7642	7571
Total	9160	7123	9907	14193	14880	21419	19855
% native	68	63	64	64	64	64	62
% non-native	32	37	36	36	36	36	38

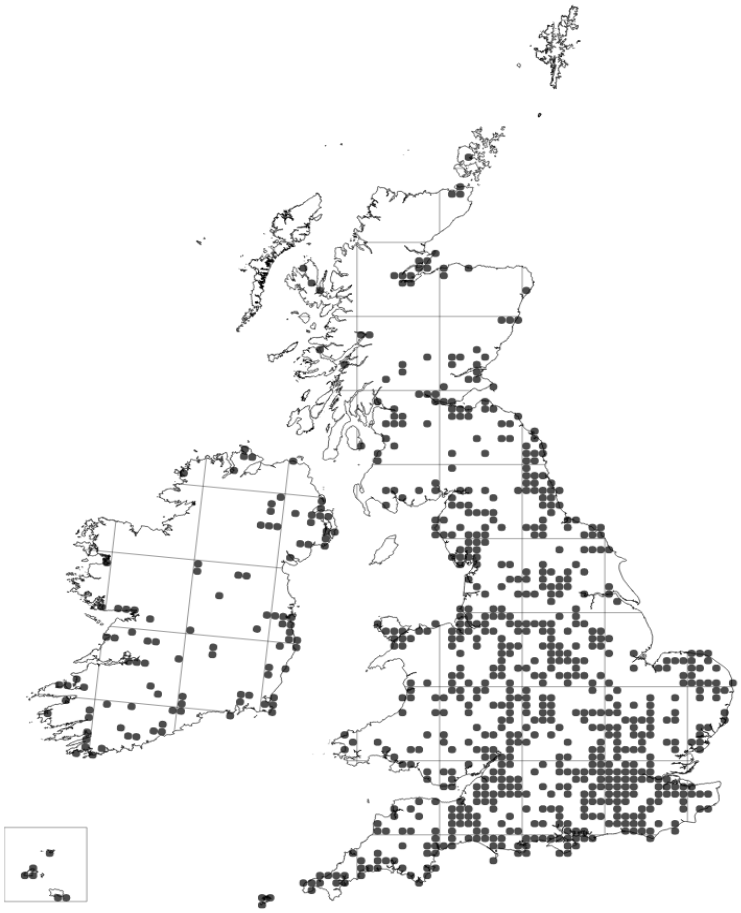

Figure 2. Map of the New Year Plant Hunt Lists received in 2022 (each dot represents a 10 x 10 km grid square in which at least one New Year Plant Hunt list was recorded).

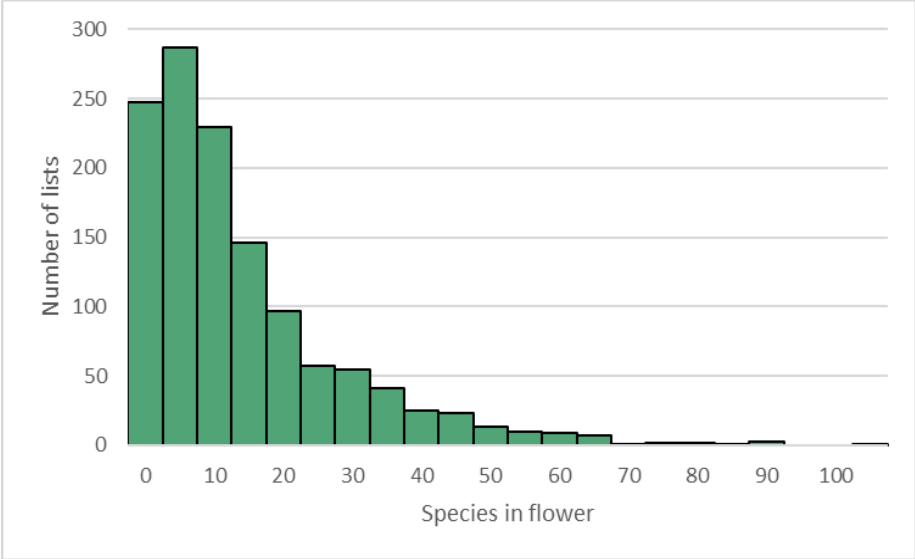

Figure 3. Histogram of the number of species recorded in flower per visit (list length) in the New Year Plant Hunt 2022.

Participants recorded an average of 16 species within the three-hour period although there was a very large range in the length of lists across the country, with one participant recording over 107 species in flower! (Fig. 3). In 2022 the average number of native species recorded was 8.7 native whereas the average number of non-natives was 6.2 (Fig. 4). The mean number of species continued to decline as compared to the previous three years but remains relatively average when compared to all previous years (Fig. 4). The total number of species recorded was significantly smaller than in 2019 and resembles the results from 2017 and 2018 (Fig 4a). This pattern was the same for both native and alien species although the overall differences were less marked for non-native species (Figs 4b and 4c). Across all three we are seeing a marked decrease in results to those in 2021 (Fig. 4).

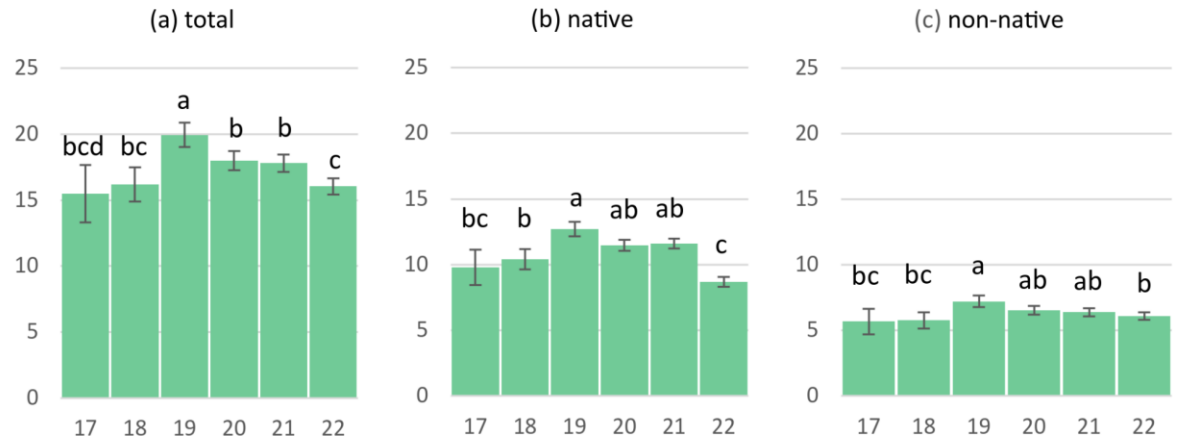

Figure 4. The mean number of species recorded in flower at New Year, 2017-2022. The significance of the differences between years was tested using a One-way ANOVA with Tukey's HSD used to test for significant differences between means: (a) total species, F = 6.551, P<0.001; (b) native species, F= 15.774, P<0.001; (c) non-native species, F= 2.913, P<0.01. Means that share the same letter on each graph are not significantly different from one another.

The top four recorded plant species have remained constant since 2015, however, the order has fluctuated: Daisy (*Bellis perennis*), Dandelion (*Taraxacum* agg.), Groundsel (*Senecio vulgaris*) and Annual Meadow-grass (*Poa annua*), were all recorded in more than fifty percent of the lists submitted this year.

Scientific name	2016	2017	2018	2019	2020	2021	2022	% in lists
Bellis perennis	1	1	1	1	1	1	1	71.1
Taraxacum agg.	2	3	3	3	4	3	2	70
Senecio vulgaris	3	2	2	2	2	2	3	63.9
Poa annua	4	4	4	4	3	4	4	56
Lamium album	8	9	6	7	7	7	5	44.4
Capsella bursa-pastoris	11	6	7	5	9	6	6	39.7
Lamium purpureum	8	9	6	7	7	7	7	39.3
Euphorbia peplus	14	7	10	9	11	9	8	38.6
Sonchus oleraceus	6	11	14	8	6	5	9	38.4
Ulex europaeus	5	5	5	11	8	11	10	35.3
Stellaria media	29	8	8	5	5	14	11	35
Veronica persica	22	10	13	10	13	17	12	29.4
Cymbalaria muralis	21	13	15	18	16	15	13	29.3
Heracleum sphondylium	12	18	11	19	15	13	14	27.9
Achillea millefolium	15	12	13	12	12	10	15	27.4

Table 5. The 15 species recorded most frequently in flower during the New Year Plant Hunt 2022. Species are listed in their rank order in 2022 and shown against their position in 2016-2022. The top ranked species are shaded dark (1-5) and light grey (6-10).

The proportions of species flowering early or late were very similar to previous years with 53% of species flowering late, 25% flowering early, and 7% flowering as expected at New Year (Fig. 5a). When considering just native species, however, it is clear that a greater proportion flowered early (24%) in 2022 as opposed to late (61%) when compared to previous years (Fig. 5b). The reason for this is currently unknown, with more research would need to be undertaken to understand why we are seeing the differences in flowering times.

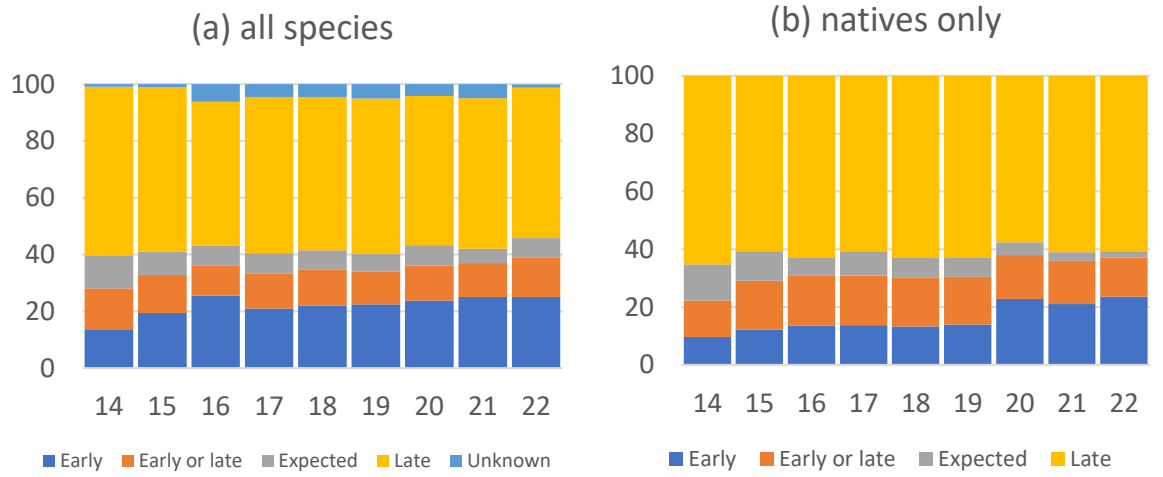

Figure 5. The proportion of plant species flowering early, early or late, late or as expected at New Year, 2014-2022. (a) all species and (b) native species only.

When the same figures are presented in terms of the total number of records of flowering a slightly different pattern emerges with most occurrences of flowering belonging to species flowering late (32%) or as expected (33%) (Fig. 6a). In comparison, only 18% of flowering

occurrences were species flowering early, highlighting their relative insignificance when compared to plants which can be expected to bloom during the winter and 'autumn stragglers'.

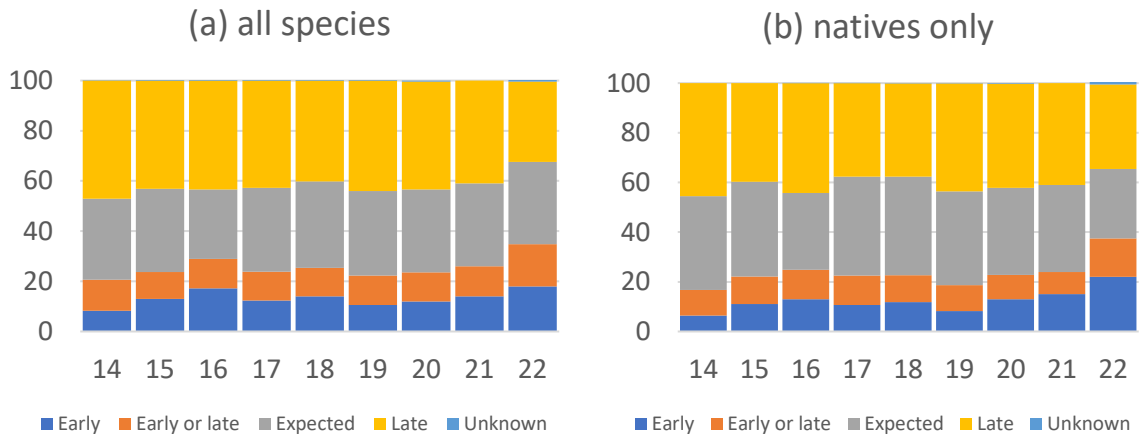

Figure 6. The proportion of records of species flowering early, early of late, late or as expected at New year, 2014-2022. (a) all species and (b) native species only.

Discussion

2022 has provided the second highest number of flowering species (669) to be recorded during the New Year Plant Hunts so far. This could be for a variety of reasons: firstly, the ongoing impact of the pandemic on how people participated in the Hunt and secondly, changes in autumn and winter weather patterns.

We received the highest ever number of lists this year (1256 lists) collected by the highest ever number of participants (1895); with more lists submitted, there is a higher probability of new species being recorded. Due to ongoing concerns around Coronavirus, fewer group hunts took place compared to pre-pandemic, meaning that more hunts would likely have been undertaken individually and in small family groups. Locations chosen for plant hunts were also more likely to be closer to home and, therefore, there may be an increase in urban lists (which tend to have higher numbers recorded). The reduction in the number of organised group hunts may also have influenced list numbers, because trained botanists leading group hunts usually provide training and guidance to people new to botanical surveying - lone recorders may feel less confident and are more likely to fail to spot more challenging taxa which require close observation to separate them from their more common counterparts. Advice on places to hunt for flowers can also dramatically influence the number of flowering species found. Even with the increases in the numbers of both lists and participants this year, it is interesting to note that the percentages of native to non-native species has remained very steady throughout 2014-2022.

The role of the coronavirus in the past two years may have gone beyond that of changing the way people have participated in NYPH. The last two years have seen a drastic change in the way we interact with wildlife, with less maintenance being used on weeds, potentially increasing the amount of wild naturalised plants, especially in urban areas. This effect was, however, more marked in the first year of the pandemic.

The temperatures leading up to the NYPH in 2022 were 1.1 degrees above average (Fig. 7). December faced unsettled and chilly weather with average rainfall, although the last few days of the month were unusually mild and, as was widely reported in the media, New Year's Day itself was the warmest on record. These temperature anomalies are taken as an average from the whole of the UK so there may be regional differences.

Due to the lack of systematic records, we can't tell whether plants are flowering more often now than in the past but what the results from NYPH clearly show is how many plants respond to 'unseasonal' weather, for example the exceptionally warm weather experienced in late 2015 when

temperatures were more than 4°C above average. Such conditions allow plants to continue flowering well into the winter, presumably because of the absence of severe frosts which would normally kill any late-flowering shoots. The implications of this for plant performance are far from clear. The premature spring growth of some arctic-alpine plants during warmer winters (as many gardeners will know) can weaken some plants due to the depletion of carbohydrate reserves and damage to tender plant parts such as buds and flowers from snow and frost (Crawford, 1997, 2000). Shifts in flowering time may also cause asynchrony between flowering and associated pollinators with potential knock-on effects for plant and insect productivity (Solga *et al*., 2014).

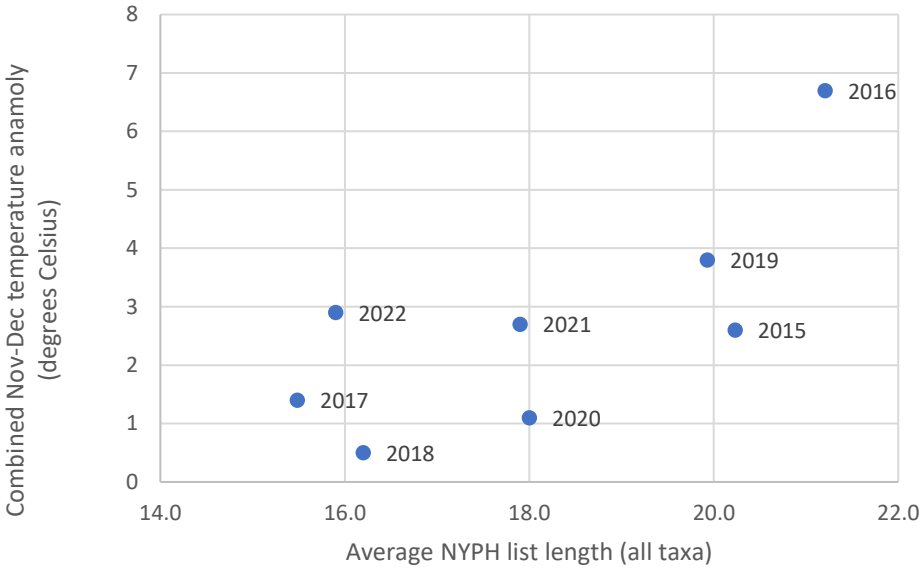

Figure 7. The combined UK mean temperature anomalies for November and December plotted against the average New Year Plant Hunt list lengths, 2015-2022. Temperature data from the UK Met Office (https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-temperature-rainfall-and-sunshine-anomaly-graphs)

A number of studies have shown that many plant species now flower earlier than in the past as a result of warmer winter and spring temperatures (Fitter & Fitter, 2002; Amano *et al*., 2010). However, the evidence from the New Year Plant Hunt is less marked with relatively few species flowering earlier rather than late, presumably because very large advances in flowering would be needed for them to be in flower at New Year. In addition, many spring-flowering (vernal) species require periods of freezing temperatures (stratification) to break dormancy and stimulate growth; consequently, phenological responses to warming will not be straightforward to predict (Crawford, 1997, 2000).

One of the most intriguing findings of the NYPH has been the sheer number of species flowering at New Year. Standard British Floras (e.g. Clapham et al., 1987) lead us to expect around 2% will be in flower in December and January. The numbers have been significantly higher than this in each year of this survey and suggests that a radical reassessment of flowering is needed, ideally based on observations at multiple sites across the whole of Great Britain and Ireland in each month.

The large numbers of non-native plants in flower at New Year has also been a notable feature of the survey largely because the majority of lists take place in urban and suburban areas where alien plant diversity is highest. In these areas, aliens as well as natives benefit from the elevated temperatures found in towns and cities (the so-called 'urban heat island-effect').

Acknowledgments

2022 saw the highest ever number of volunteers working with BSBI staff members to support the highest ever number of NY Plant Hunters. Volunteers Laurel Mayne, Moira O'Donnell (BSBI Events & Communications Committee), Jo Parmenter (BSBI Science & Data Committee), Holly Sayer and

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