New Year Plant Hunt 2023

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Gorse *Ulex europaeus* blooming in the Cairngorms on New Year's Day 2023
Image courtesy of Sarah Watts

Summary

- The BSBI's twelfth New Year Plant Hunt (NYPH 2023) took place between Saturday 31st December 2022 and Tuesday 3rd January 2023. 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.
- 1,691 recorders took part, submitting 10,199 records on 1,002 lists including 37 hunts that yielded no records of plants in flower.
- 477 plant species were recorded in bloom, a 28% decline compared to 2022 and the lowest total since 2015.
- The four species most frequently recorded in flower in 2023 in rank order, were Groundsel (*Senecio vulgaris*), Daisy (*Bellis perennis*), Dandelion (*Taraxacum* agg.) and Red Dead-nettle (*Lamium purpureum*) – this was the first year that Red Dead-nettle appeared in the 'Top Four'.
- In 2023, as in previous years, more species were flowering late (57%) than early (22%) whereas 21% of species were flowering as expected at New Year including species that flower all-year round.
- These proportions of species flowering early, late or as expected were broadly similar to previous years. However, the overall numbers of species flowering were lower than in previous years due to the more severe frosts experienced in December prior to the survey taking place.

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; Goddard, Walker & Marsh, 2021; Rowley, Humphrey & Marsh, 2022). Participation has grown steadily and for the past two years over 2500 participants recorded lists of flowering plants from over 1,700 locations across Britain and Ireland (Rowley, Humphrey & Marsh, 2022). 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 winter months when few botanical activities typically take place. More than a decade 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 2023.

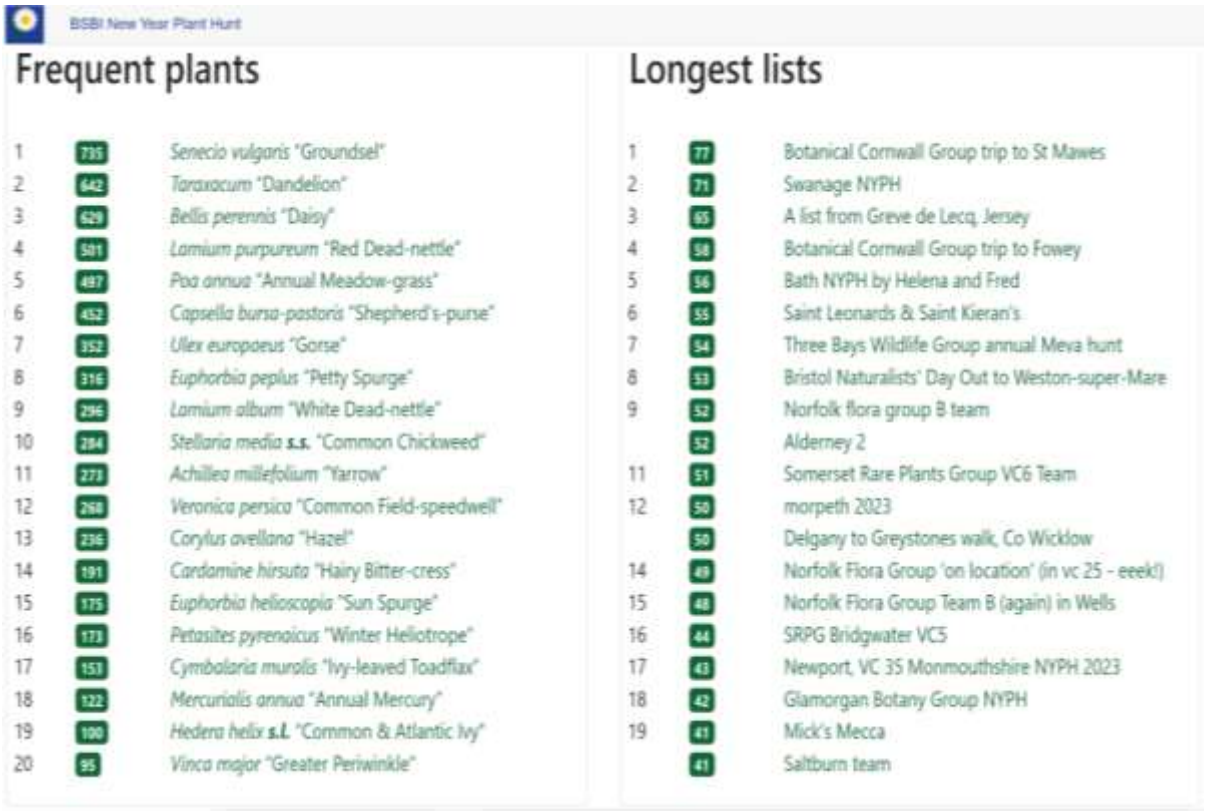
Method

For NYPH 2023, volunteers picked a day between 31st December 2022 and 3rd January 2023 and recorded all native and non-native plants that they found in flower on a walk not exceeding three hours, excluding breaks and time travelling between sites. Plants that had obviously been planted in private and public gardens were excluded.

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). 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 improved 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 only identified to genera or family level. 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 several non-natives, the normal flowering period was not known.


BSBI New Year Plant Hunt

Frequent plants

1	735	*Senecio vulgaris* "Groundsel"
2	642	*Taraxacum* "Dandelion"
3	629	*Bellis perennis* "Daisy"
4	501	*Lamium purpureum* "Red Dead-nettle"
5	497	*Poa annua* "Annual Meadow-grass"
6	452	*Capsella bursa-pastoris* "Shepherd's-purse"
7	352	*Ulex europaeus* "Gorse"
8	316	*Euphorbia peplus* "Petty Spurge"
9	296	*Lamium album* "White Dead-nettle"
10	284	*Stellaria media* **s.s.** "Common Chickweed"
11	273	*Achillea millefolium* "Yarrow"
12	268	*Veronica persica* "Common Field-speedwell"
13	236	*Corylus avellana* "Hazel"
14	191	*Cardamine hirsuta* "Hairy Bitter-cress"
15	175	*Euphorbia helioscopia* "Sun Spurge"
16	173	*Petasites pyrenaicus* "Winter Heliotrope"
17	153	*Cymbalaria muralis* "Ivy-leaved Toadflax"
18	122	*Mercurialis annua* "Annual Mercury"
19	100	*Hedera helix* **s.l.** "Common & Atlantic Ivy"
20	95	*Vinca major* "Greater Periwinkle"

Longest lists

1	77	Botanical Cornwall Group trip to St Mawes
2	71	Swanage NYPH
3	65	A list from Greve de Lecq, Jersey
4	58	Botanical Cornwall Group trip to Fowey
5	56	Bath NYPH by Helena and Fred
6	55	Saint Leonards & Saint Kieran's
7	54	Three Bays Wildlife Group annual Meva hunt
8	53	Bristol Naturalists' Day Out to Weston-super-Mare
9	52	Norfolk flora group B team
	52	Alderney 2
11	51	Somerset Rare Plants Group VC6 Team
12	50	morpeth 2023
	50	Delgany to Greystones walk, Co Wicklow
14	49	Norfolk Flora Group 'on location' (in vc 25 - eeek!)
15	48	Norfolk Flora Group Team B (again) in Wells
16	44	SRPG Bridgwater VC5
17	43	Newport, VC 35 Monmouthshire NYPH 2023
18	42	Glamorgan Botany Group NYPH
19	41	Mick's Mecca
	41	Saltburn team

Figure 1. Output from the New Year Plant Hunt 2022 Results webpage: https://nyph.bsbi.org/results.php?year=2023

Results

1,691 participants took part in 2023, submitting 10,199 records of 477 plant species. This represents an 10.8% decrease in participants compared to the previous year (Table 1). 1,002 lists were submitted in total, including 37 null lists in which plant hunters found no species in bloom; this represents a decrease of 20.2% in the number of lists submitted compared to 2022 (Fig. 2). From these lists 10,199 unique records were used in the analysis, a decrease of 50.5% compared to 2022. The number of lists produced in each country reveals a uniform decrease in records with some variation (Table. 2).

Overall 477 different plant species were recorded which is the lowest total in over eight years. Whilst the relative percentage of native and non-native species was roughly even, as in previous years (Table 3), a greater proportion of the total was made up by non-natives than in all previous years of the survey (Table 4).

Table 1. The number of individuals participating, Number of submitted lists, the number of records submitted in the New Year Plant Hunts, 2017-2023, with increase in percentage shown for 2023 in comparison to 2022.

	2017	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**% change 2022-2023**
Participants	416	>800	1471	1714	1811	1895	1691	-10.8
Lists	460	612	712	798	1185	1256	1002	-20.2
Records	7123	9907	14193	14880	21419	20612	10199	-50.5

Table 2. The number of New Year Plant Hunt lists submitted 2017-2023 broken down by country, with percentage increase shown for 2023 in comparison to 2022.

Number of lists	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**% change 2022-2023**
England	282	427	466	538	821	923	695	-24.7
Wales	28	33	41	42	132	76	66	-13.2
Scotland	43	56	94	102	138	122	99	-18.6
Ireland	104	94	99	90	98	126	98	-22.2
Channel Isles	3	2	6	7	6	9	6	-33.3
Isle of Man	0	0	6	19	0	0	0	0
Total	460	612	712	798	1185	1256	1002	-20.2

Table 3. The number of plant species recorded during the New Year Plant Hunt 2017-2023.

Number of species	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Native	205	311	264	291	327	322	379	315	207
Non-native	161	300	228	241	300	293	331	354	270
Total	366	611	492	532	627	615	710	669	477
% native	56	51	54	55	52	52	53	47	43
% non-native	44	49	46	45	48	48	47	53	57

Table 4. The number of individual records made during the New Year Plant Hunt 2017-2023.

Number of records	2017	2018	2019	2020	2021	2022	2023
Native	4509	6376	9055	9521	13777	12284	5212
Non-native	2614	3531	5138	5359	7642	7571	4987
Total	7123	9907	14193	14880	21419	19855	10199
% native	63	64	64	64	64	62	51
% non-native	37	36	36	36	36	38	49

Figure 2. Map of the New Year Plant Hunt Lists received in 2023 (each dot represents a 10 x 10 km grid square in which at least one New Year Plant Hunt list was recorded).

Participants recorded an average of 11.? (±?) species within the three-hour period although there was a large range in the length of lists across the country, with one list recording over 77 species in flower and 37 null returns (Figs 3 & 4a). The longest lists tended to be submitted by established botanical recording groups rather than individuals. In 2023 the average number of native species recorded was 6.4 (±?) natives (Fig. 4b) whereas the average number of non-natives was 5.4 (±?) (Fig. 4c). The mean number of natives recorded was significantly lower than all previous years (Fig 4b). The overall number of species was significantly lower than 2019-2021 but not other years (Fig. 4a) whereas the mean number of non-natives recorded was only significantly lower than in 2019 (Fig. 4c).

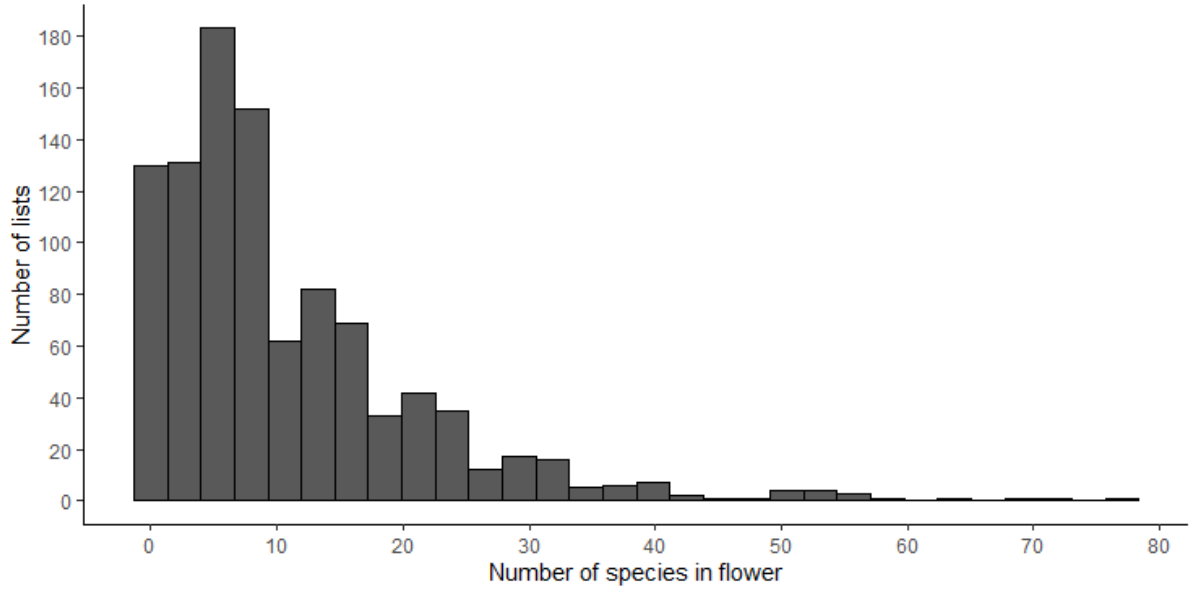


Figure 3. Histogram of the number of species recorded in flower per visit (list length) in the New Year Plant Hunt 2023.

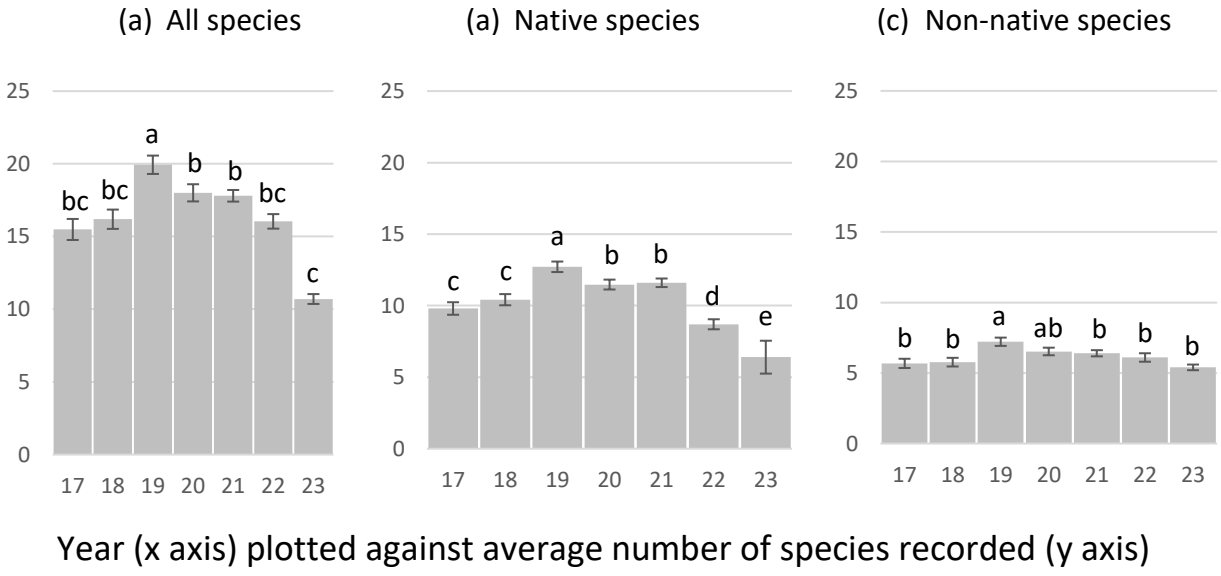


Figure 4. The mean number of species recorded in flower at New Year, 2017-2023. The significance of the differences between years was tested using a One-way ANOVA with Tukey's HSD used to test for significant differences between means: (a) total species, F = 6.551, P<0.001; (b) native species, F= 15.774, 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.

Although the top three recorded plant species have remained constant since 2015, their order, in terms of frequency, has fluctuated: Daisy (*Bellis perennis*), Dandelion (*Taraxacum* agg.), Groundsel (*Senecio vulgaris*) were all recorded in more than fifty percent of the lists submitted in 2023. Red Dead-nettle (*Lamium purpureum*), an archaeophyte which colonises fertile and disturbed soils, entered the 'Top Four' for the first time, displacing Annual meadow-grass (*Poa annua*); furthermore,

a new plant record for the NYPH, Sun Spurge (*Euphorbia helioscopia*), a species that was recorded for the first time in NYPH in 2023, was ranked 15th in terms of frequency (Table 5).

Table 5. The 15 species recorded most frequently in flower during the New Year Plant Hunt 2023. Species are listed in their rank order in 2023 and shown against their position in 2017-2023. The top ranked species are shaded dark (1-5) and light grey (6-10).

Scientific name	2017	2018	2019	2020	2021	2022	2023	% of lists
Senecio vulgaris	2	2	2	2	2	2	1	70
Taraxacum agg.	3	3	3	4	3	3	2	63
Bellis perennis	1	1	1	1	1	1	3	62
Lamium purpureum	9	6	7	7	7	7	4	50
Poa annua	4	4	4	3	4	4	5	47
Capsella bursa-pastoris	6	7	5	9	6	6	6	45
Stellaria media	8	8	5	5	14	14	7	43
Ulex europaeus	5	5	11	8	11	11	8	35
Euphorbia peplus	7	10	9	11	9	9	9	32
Lamium album	9	6	7	7	7	8	10	30
Achillea millefolium	12	13	12	12	10	10	11	27
Veronica persica	10	13	10	13	17	17	12	27
Corylus avellana	13	11	12	17	23	24	13	24
Cardamine hirsuta	17	22	15	15	21	21	14	19
Euphorbia helioscopia	NA	NA	NA	NA	NA	NA	15	18

Although a higher proportion of species were flowering late (57%) in 2023 there was little change in the proportion of species that were flowering early (22%) or as expected at New Year (5%) (Fig. 5a). A weaker but similar trend was seen with natives with 62% flowering late and 22% flowering early (Fig. 5b). Looking over the last three years there appears to be a trend of later flowering, although the reason for this is unclear and research is needed to fully explain these trends.

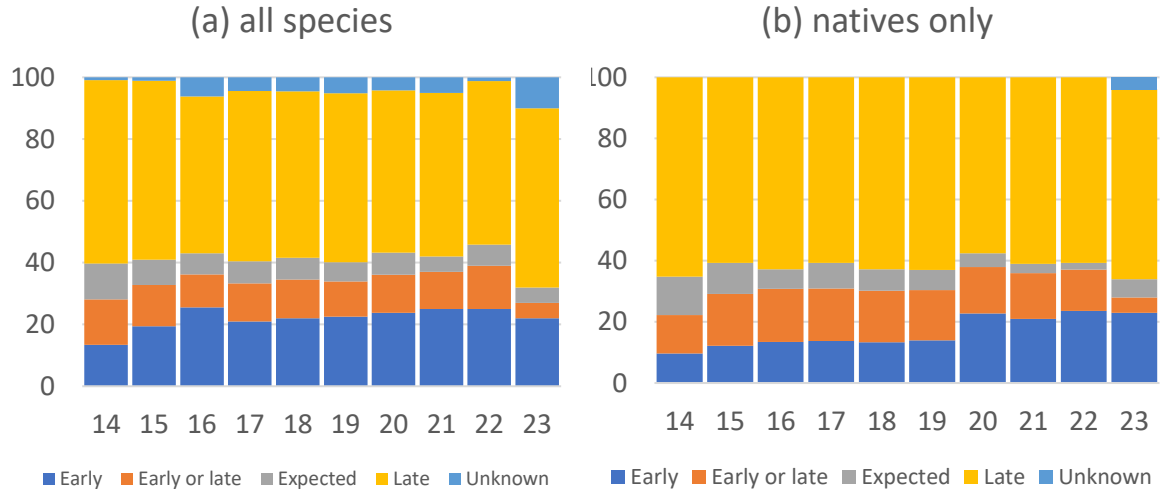


Figure 5. The proportion of plant species flowering early, early or late, late or as expected at New Year, 2014-2023. (a) all species and (b) native species only.

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 (49%) or as expected (24%) (Fig. 6a). In comparison, only 11% 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'.

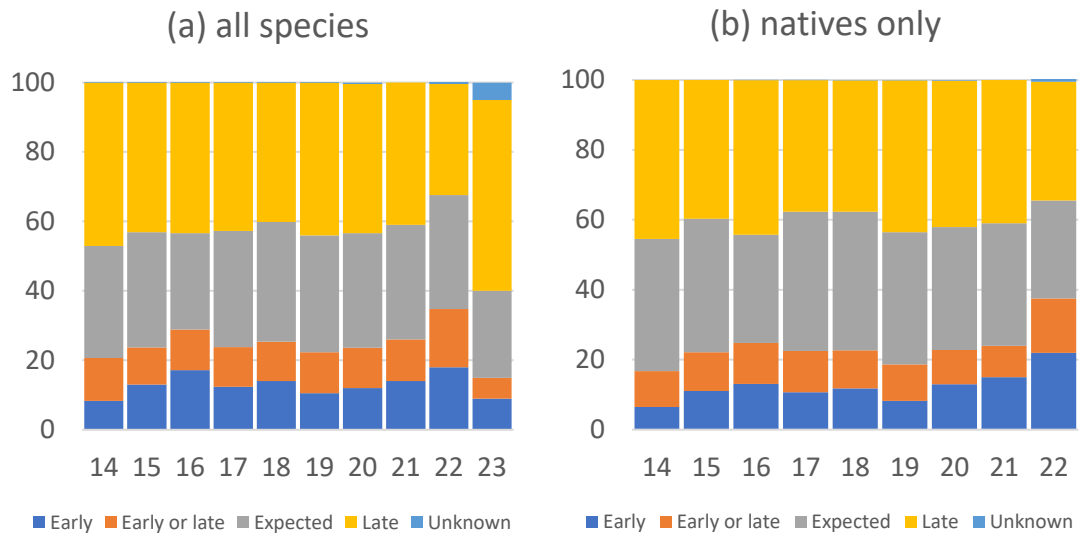


Figure 6. The proportion of records of species flowering early, early of late, late or as expected at New year, 2014-2023. (a) all species and (b) native species only.

Discussion

The temperatures prior to NYPH 2023 were more mixed than in previous years of the survey. December 2022 started off as one of the coldest for many years, although it was followed by much milder conditions bringing a widespread thaw (Met Office, 2023). The temperature was 1.7 degrees above average although these temperature anomalies were taken as an average from the whole of the UK so there may be regional differences (Fig. 7). Many recorders in Scotland and northern England reported being unable to go out recording due to freezing conditions, which may also have led to the unusually high number of lists with no species recorded in flower. In many cases recorders followed the same routes that they had taken in previous years and emailed or took to social media to report that they were finding around half the species than in previous years.

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).

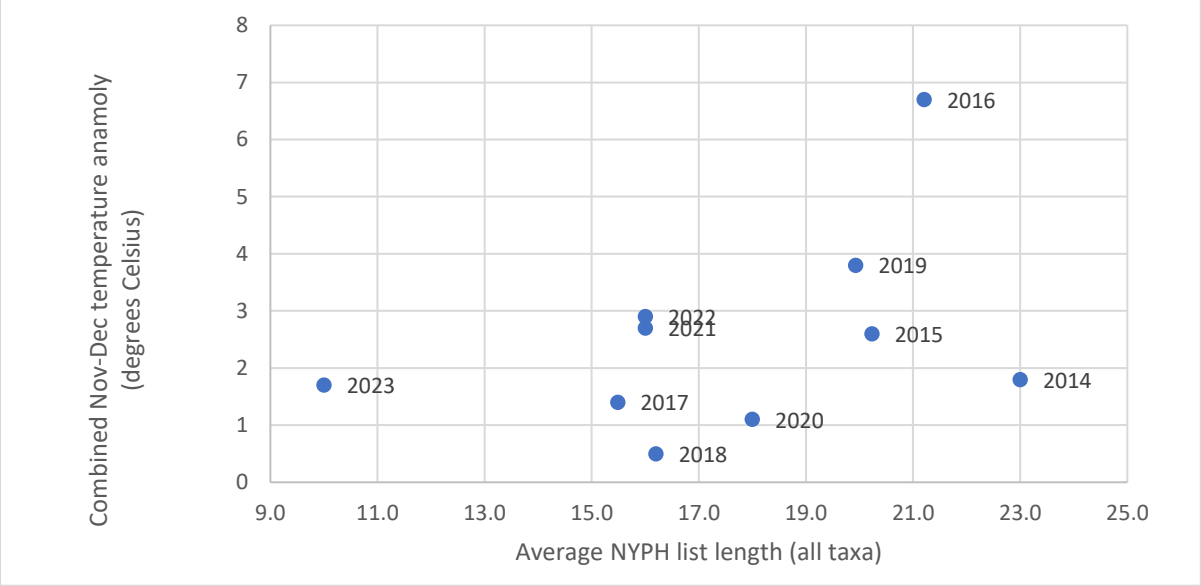


Figure 7. The combined UK mean temperature anomalies for November and December plotted against the average New Year Plant Hunt list lengths, 2014-2023. Temperature data from the UK Met Office using the 1961 -1990 period as the anomaly control. (https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-temperature-rainfall-and-sunshine-anomaly-graphs)

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 hunts 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').

Most participants in the NYPH 2023 went out in small groups with family and friends, or on their own. A small number of established botany groups used social media to organise communal plant hunts, and these group hunts tended to submit longer lists, but there were far fewer group hunts compared to pre-pandemic levels. Group hunts tend to attract large groups of plant hunters at all skill levels, from beginner to expert, who benefit from the plant identification advice on offer and enjoy the social aspect of the NYPH; hopefully as the fear of Covid continues to recede, we will see a resurgence of communal plant-hunting in the coming years.

Acknowledgments

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