# BSBI New Year Plant Hunt 2020

Kevin Walker (BSBI Head of Science) & Louise Marsh
(BSBI Communications Officer)

## Summary

- The BSBI's ninth New Year Plant Hunt (NYPH) took place between Wednesday 1st and Saturday 4th January 2020. Volunteers submitted lists of native and non-native plants they found in flower 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.
- 1,714 recorders took part in 2020, submitting 14,724 records of 615 plant species on 798 lists. This total includes 20 lists where Hunts had yielded no records of plants in flower.
- The four species most frequently recorded in flower in 2020 were identical to previous years: in rank order these were Daisy *Bellis perennis*, Groundsel *Senecio vulgaris*, Dandelion *Taraxacum* agg., and Annual Meadow-grass *Poa annua*.
- In 2020, almost twice as many species recorded were flowering late (53%) rather than early (24%), as opposed to 23% 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 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). Participation has grown steadily and in 2019 over 1000 participants recorded lists of flowering plants from over 700 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. However, it is now providing valuable insights into how many species normally flower during the winter as well as how species are responding changing weather patterns as a consequence of climate change. 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 2020.

## Method

For NYPH 2020 volunteers picked a day between 1-4 January 2020 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.

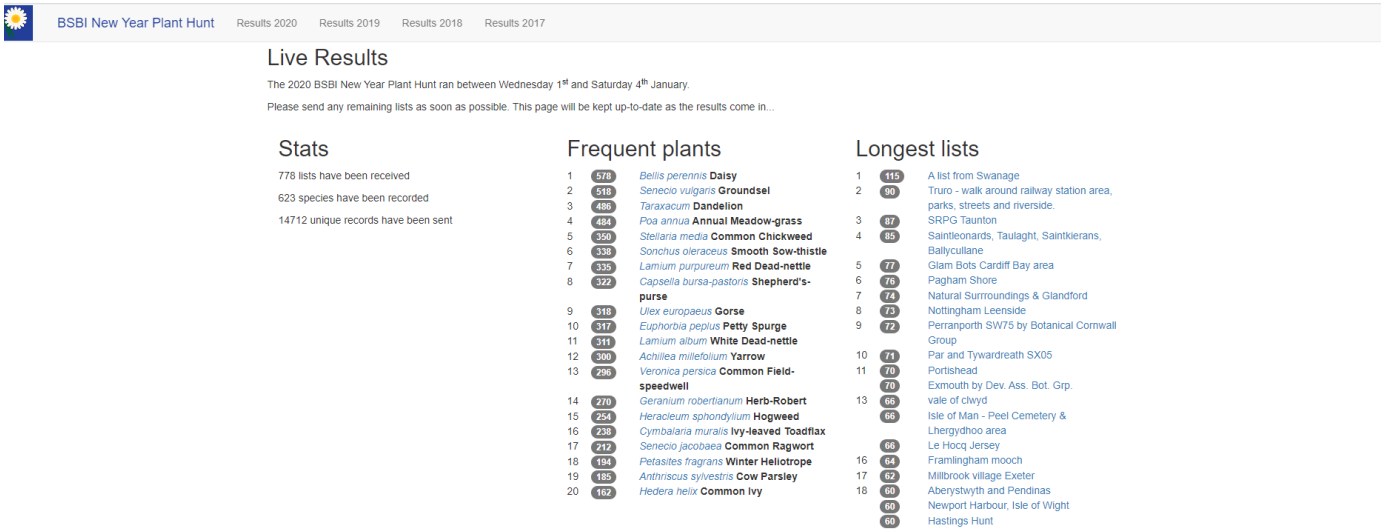
The majority of lists were submitted via a smartphone, tablet or PC, allowing the results to be viewed simultaneously as they came in (Fig. 1). This substantially increased the efficiency of data entry and reduced errors during data processing. Data validation prior to analyses included checking the 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 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 four phenological categories based on their 'typical' flowering months as given in standard floras. For this we published the flowering months given in Clapham *et al*. (1987) and Sell & Murrell (1996-2018). Species were categorised as 'expected' 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-native plants, the normal flowering period was not known.

**Figure 1.** Screenshot of the New Year Plant Hunt 2020 Results webpage.



## Results

In 2020, a total of 1,714 individuals uploaded records of plants in bloom; this represented an increase of 16% compared to 2019. Many people opted to join one of the 40+ group hunts advertised in advance via the BSBI website, and comments on social media suggest that others opted to go out recording with family and friends, making the NYPH a social event as much as an exercise in recording. A further group of people posted casual observations on social media of plants spotted in flower but only records submitted via the online recording form were included in this analysis.

**Table 1.** The number of individuals participating in the New Year Plant Hunts, 2015-2019.

| 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| c.300 | 405 | 416 | >800 | 1471 | 1714 |

In total, 798 lists were submitted from across the whole of Britain and Ireland (Fig. 2) an increase of 86 from 2019 (Table 2). These lists comprised a total of 14,880 unique records of 615 species (12 less species than in 2019) and, as in previous years, these comprised a roughly equal number of native (52%) and non-native species (48%) (Table 3). As in previous years, native species accounted for roughly two-thirds of all the records collected (64%) (Table 4).

**Table 2.** The number of NYPH lists submitted 2015-2020.

| Lists | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| England | 101 | 297 | 282 | 427 | 466 | 538 |
| Wales | 10 | 19 | 28 | 33 | 41 | 42 |
| Scotland | 9 | 64 | 43 | 57 | 94 | 102 |
| Ireland | 21 | 50 | 104 | 94 | 99 | 90 |
| Channel Isles | 2 | 2 | 3 | 2 | 6 | 7 |
| Isle of Man | 0 | 0 | 0 | 0 | 6 | 19 |
| Total | 143 | 432 | 460 | 612 | 712 | 798 |

**Table 3.** The number of plant species recorded during the NYPH 2015-2020.

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Native | 206 | 313 | 264 | 290 | 327 | 322 |
| Non-native | 160 | 298 | 228 | 242 | 300 | 293 |
| Total | 366 | 611 | 492 | 532 | 627 | 615 |
| % native | 56 | 5 | 54 | 55 | 52 | 52 |
| % non-native | 44 | 49 | 46 | 45 | 48 | 48 |

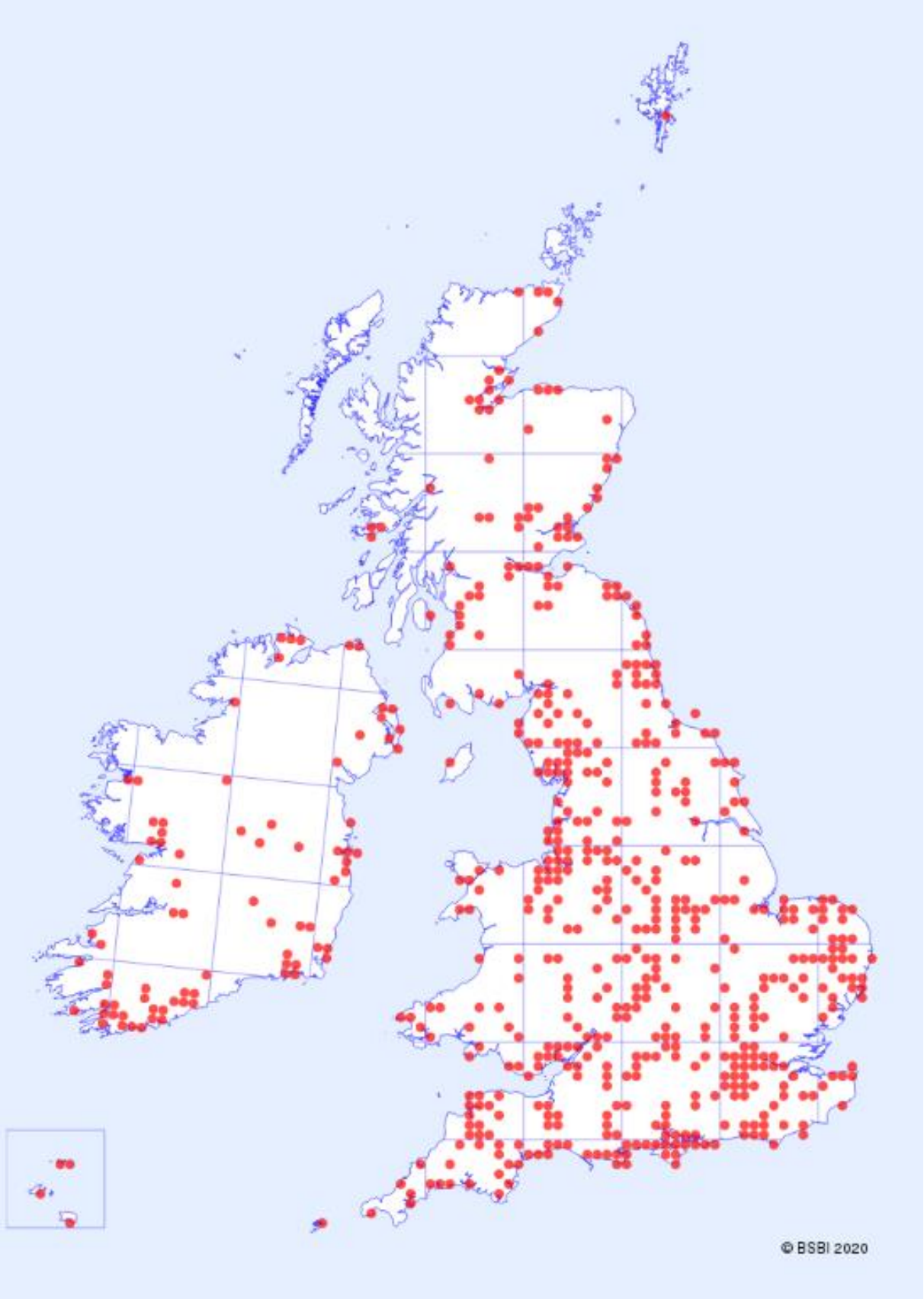



**Figure 2.** Map of the New Year Plant Hunt lists received in 2020 (each dot represents a 10 × 10 km grid square in which at least one NYPH list was recorded).

**Table 4.** The number of individual records made during the NYPH 2015-2020.

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Native | 1874 | 6210 | 4509 | 6376 | 9055 | 9521 |
| Non-native | 1019 | 2950 | 2614 | 3531 | 5138 | 5359 |
| Total | 2893 | 9160 | 7123 | 9907 | 14193 | 14880 |
| % native | 65 | 68 | 63 | 64 | 64 | 64 |
| % non-native | 35 | 32 | 37 | 36 | 36 | 36 |

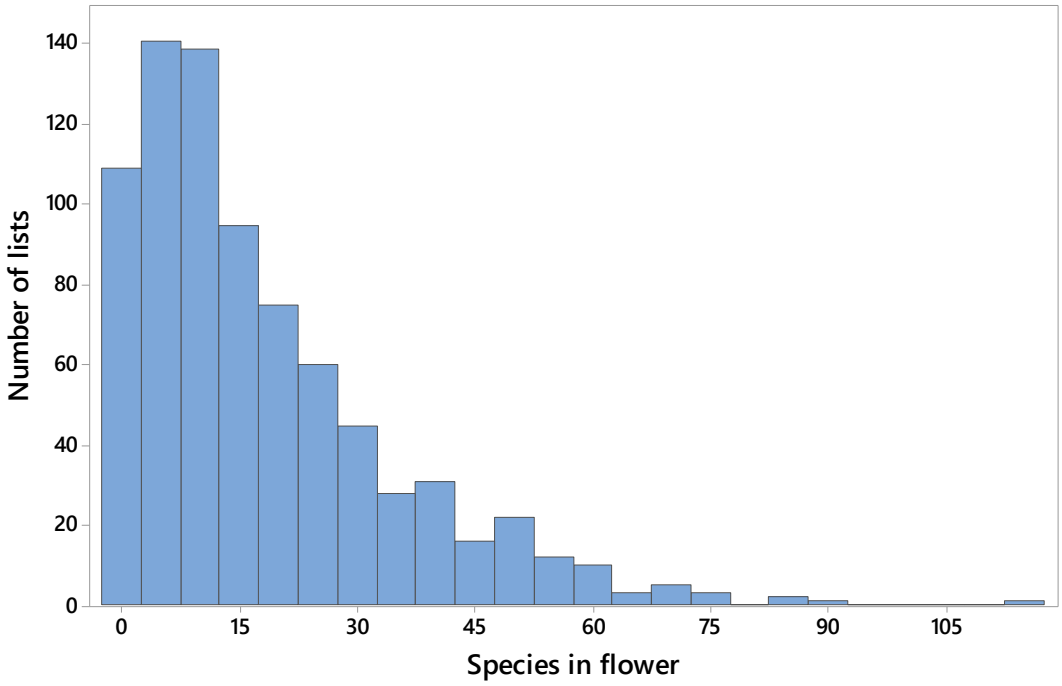



**Figure 3.** Histogram of the number of species recorded in flower per visit (list length) in NYPH 2020.

Participants recorded an average of 18.0 species within the three-hour period although there was a very large range in the length of lists across the country with some participants recording over 70 species in flower and one participant recording 111! (Fig. 3). In 2020 the average number of native species recorded was 11.5 native whereas the average number of non-natives was 6.5 (Fig. 4). All these figures are slightly lower than 2019 but relatively average when compared to previous years (Fig. 4). The total number of species recorded was higher than 2017 and 2018 (but not significantly so) but slightly less than 2015, 2016 and 2019, but only significantly less than 2016 (Fig 4a). This pattern was the same for both native and alien species although the overall differences were less marked for alien species (Figs 4b and 4c).

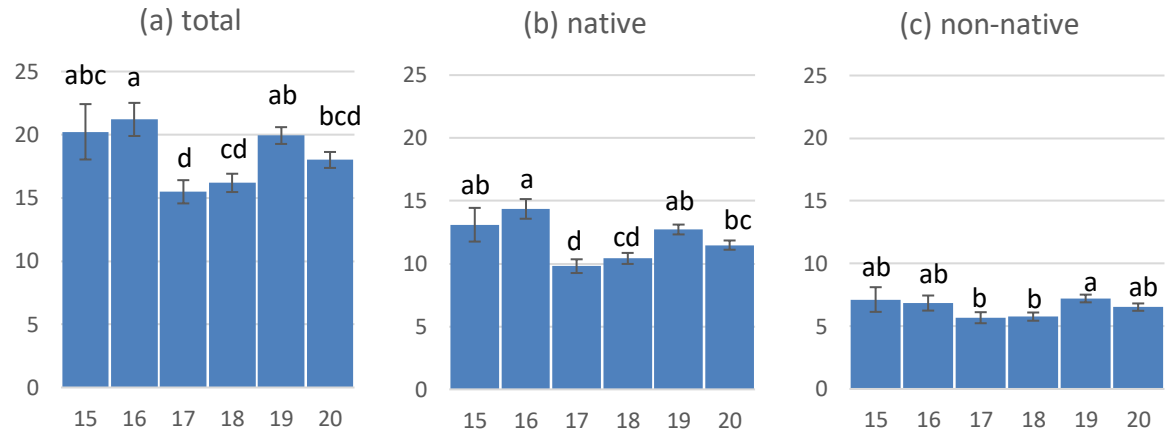



**Figure 4**. The mean number of species recorded in flower at New Year, 2015-2020. The significance of the differences between years was tested using a One-way ANOVA with Tukey's HSD used to test for significant differences between means: (a) total species, $F = 8.86$, $P < 0.001$; (b) native species, $F = 13.65$, $P < 0.001$; (c) non-native species, $F = 3.65$, $P < 0.01$. Means that share the same letter on each graph are not significantly different from one another.

As in all previous years the four species most frequently recorded in flower were Daisy (*Bellis perennis*), Groundsel (*Senecio vulgaris*), Annual Meadow-grass (*Poa annua*) and Dandelion (*Taraxacum* agg.) with all occurred in two-thirds or more of the lists submitted (Table 5). As in 2019 Chickweed (*Stellaria media*) was fifth most frequently recorded species in flower in contrast to the warmer autumns of 2015 and 2016 when it was far less frequently recorded in flower. Other species which flowered frequently in 2020 as in previous years included Perennial Sow-thistle (*Sonchus oleraceus*), Red Dead-nettle (*Lamium purpureum*), Gorse (*Ulex europaeus*), White Dead-nettle (*L. album*) and Shepherd's-purse (*Capsella bursa-pastoris*).

**Table 5.** The 20 species recorded most frequently in flower at New Year in 2020. Species are listed in their rank order in 2020 and shown against their positions in 2015-2019. The top 10 ranked species are shaded dark (1-5) and light grey (6-10).

| Scientific name | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | % |
|---|---|---|---|---|---|---|---|
| *Bellis perennis* | 1 | 1 | 1 | 1 | 1 | 1 | 82.0 |
| *Senecio vulgaris* | 3 | 3 | 2 | 2 | 2 | 2 | 72.2 |
| *Poa annua* | 4 | 4 | 4 | 4 | 4 | 3 | 66.7 |
| *Taraxacum* agg. | 1 | 2 | 3 | 3 | 3 | 4 | 65.8 |
| *Stellaria media* | 10 | 29 | 8 | 8 | 5 | 5 | 46.4 |
| *Sonchus oleraceus* | 7 | 6 | 11 | 14 | 8 | 6 | 45.6 |
| *Lamium purpureum* | 13 | 8 | 9 | 6 | 7 | 7 | 45.2 |
| *Ulex europaeus* | 5 | 5 | 5 | 5 | 11 | 8 | 43.4 |
| *Lamium album* | 9 | 10 | 16 | 9 | 13 | 9 | 42.9 |
| *Capsella bursa-pastoris* | 6 | 11 | 6 | 7 |  | 9 | 42.9 |
| *Euphorbia peplus* | 8 | 14 | 7 | 10 | 9 | 11 | 42.4 |
| *Achillea millefolium* | 14 | 15 | 12 | 13 | 12 | 12 | 40.4 |
| *Veronica persica* | 12 | 22 | 10 | 13 | 10 | 13 | 39.2 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Geranium robertianum* | 23 | 8 | 29 | 29 | 14 | 14 | 36.5 |
| *Heracleum sphondylium* | 10 | 12 | 18 | 11 | 19 | 15 | 34.1 |
| *Cymbalaria muralis* | 19 | 21 | 13 | 15 | 18 | 16 | 31.2 |
| *Senecio jacobaea* | 16 | 7 | 15 | 21 | 16 | 17 | 28.5 |
| *Petasites fragrans* | 15 | 28 | 14 | 17 | 23 | 18 | 25.3 |
| *Anthriscus sylvestris* | 31 | 31 | 61 | 30 | 85 | 19 | 24.7 |
| *Hedera helix* | 16 | 27 | 19 | 19 | 37 | 20 | 24.4 |

The proportions of species flowering early or late were very similar to previous years with 53% of species flowering late, 24% flowering early, and 7% flowering as expected at New Year (Fig. 5a). These percentages were almost identical to previous years, the only notable difference being the slightly higher proportion of species flowering early in 2016. However, when considering just native species it is clear that more native species (as a proportion) flowered early (23%) in 2020 as opposed to late (58%) when compared to previous years (Fig. 5b). The reason for this is unknown.

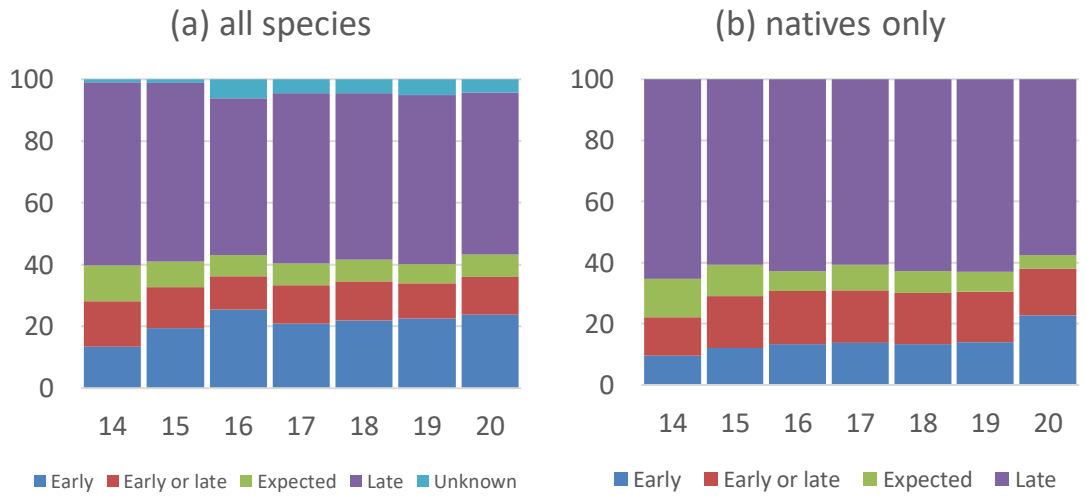



**Figure 5**. The proportion of plant species flowering early, late or as expected at New Year, 2014-2020. (a) all species and (b) native species only.

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 (43%) or as expected (33%) (Fig. 4a). In comparison, only 12% of flowering occurrences were species flowering early, highlighting their relative insignificance when compared to winter flowerers and autumn stragglers.

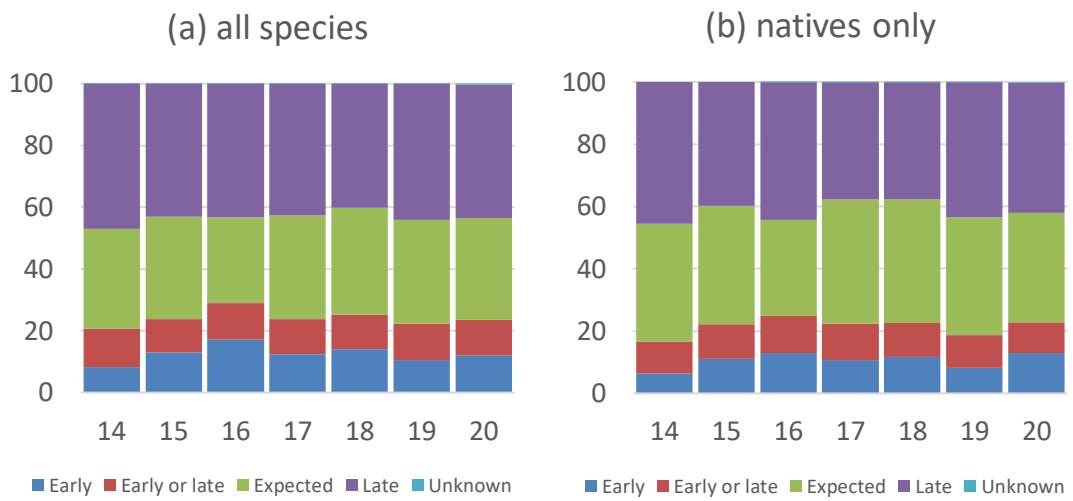



**Figure 6**. The proportion of records of species flowering early, late or as expected at New Year, 2014-2020. (a) all species and (b) native species only.

## Discussion

2020 appears to have been an average year in terms of winter flowering in comparison to previous years with fewer species in flower than in 2015, 2016 and 2019 but more than in 2017 and 2018. The reason for this is clear – temperatures in the two months preceding NYPH 2020 were only a degree above average compared to 2015, 2016 and 2019 when the combined temperature anomalies were much higher (Fig. 7). This was largely due to the cold and wet conditions experienced across much of the country in late 2019, especially in November when the Midlands and Northern England experienced widespread flooding.

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 plants 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 by 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).

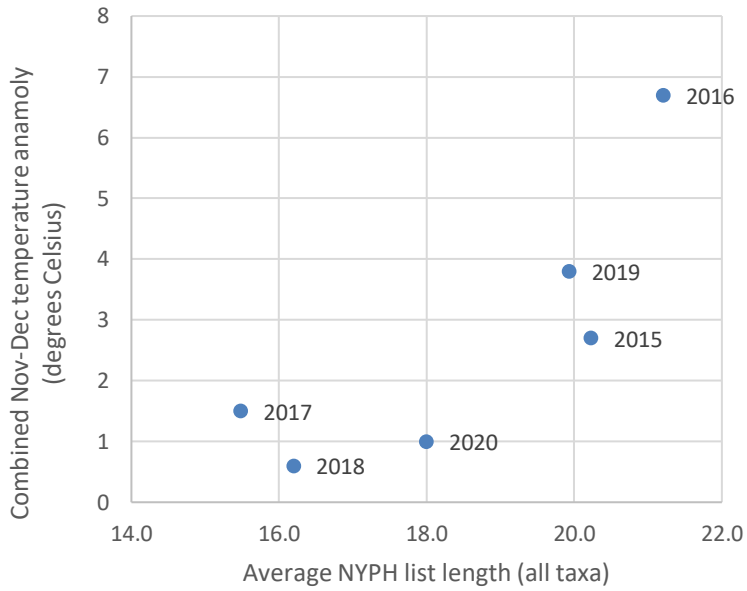



**Figure 7**. The combined UK mean temperature anomalies for November and December plotted against the average NYPH list lengths, 2015-2020. Temperature data from UK Met Office (https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-temperature-rainfall-and-sunshine-anomaly-graphs).

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 NYPH 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 numbers of species in flower 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

We owe a huge debt of gratitude to all the volunteers who took part in NYPH 2020 as well as members of BSBI's Events & Communications Committee who worked tirelessly to make the project a success: Ryan Clark, Ciara Dwyer, George Garnett, Ellen Goddard, Jodey Peyton, Kylie Jones and Cathy Wilson provided support on the Help Desk over the busy New Year period, while Ian Denholm, Brian Laney and Moira O'Donnell checked identifications. We would also like to thank Tom

Humphrey (BSBI Database Officer) for developing and supporting the online recording form and website.

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