The verification of plant records: guidance for NPMS surveyors

1. The importance of verification
Verification is the act or process of verifying - a statement of truth or correctness. When applied to biological recording it is the process of checking that occurrence records are free from errors, and to provide feedback on identification. This is usually carried out by a recognised expert with specialist knowledge in a particular group of organisms in a specific geographic area. This verification process helps ensure the records are of the highest quality possible and supports recorder learning and development. It is important to mention validation as well, as this term is sometimes used in biological recording to describe the checking of the who, what and where questions i.e. who made the observation, where it was made and when, but not the identification. In this sense verification checks are usually carried out by species experts, whereas validation is mainly automated as checks within data management systems.

2. Basic principles
We all make mistakes, whatever our level of expertise, and so verification provides an efficient means of identifying and, where-ever possible, correcting them. Clearly this is vital for any biological monitoring or recording scheme that rely on accurate identifications to produce outputs such as distribution maps or trend information. Whilst a single error may be trivial, the cumulative impact of easily rectified mistakes can reduce the overall value of a dataset.

At its most basic level, verification may help to ensure that the name of the organism is correct and not a misidentification or transcription error caused during data entry. For example, Purple Spurge *Euphorbia peplis* has been extinct in Britain and Ireland for many years but the BSBI receives records of this species annually due to incorrect spellings of Petty Spurge *E. peplus*, which probably occurs in virtually every garden in the country!

It is also important to check that the location of the record is correct; species that appear to be growing 'in the wrong place' are often, but not always, due to incorrect identifications or data entry errors. Basic geographic checks include verifying whether the record comes from within the known range of the species; if not, then the verifier may want to check with the recorder that the species name is as intended. Other spatial checks include checking that grid refences are in places where the species is likely to occur based on its habitats and ecology (e.g. montane plants in mountains, coastal plants near the sea), or that they match the geographical area described (e.g. placename, county).

The timing of a record can also be useful in helping to verify a record, especially if a species has a very specific flowering period (e.g. in the spring), although this is limited if a species can be identified vegetatively throughout the year. For example, Bee Orchid *Ophrys apifera* is unmistakeable when in flower but once you are familiar with their distinctive winter-green rosettes it can be identified all year round.

Some of these checks can be automated within digital recording systems but, ultimately, verification relies on a human to make a judgement on whether a record is correct or not.

3. How are NPMS records verified?
NPMS records are collected and stored in the same data management system (Indicia) that underpins a free online biological recording system called iRecord. You may be familiar with this web and mobile based application, which accepts records of any taxa with a variety of data input methods and is used by many different recording schemes. iRecord is particularly notable for its inbuilt verification interface, which the NPMS, as well as many other biological recording websites,

can link to and make use of. If you have an account in iRecord, you will see that your NPMS records appear there too.

Since the NPMS was launched in 2015, automated checks have been used to verify records submitted to the scheme. Some of these are based on rule-sets that are stored within the system described above. There are three main auto-checks that utilise these rule-sets to identify potential errors:

- **Known range**: This is the most important auto-check and uses the known range of a species as defined by the distribution data held by the BSBI. Specifically, the geo-spatial reference assigned to a record (lat./long., grid reference) is automatically checked to see whether it falls within the known range of a species at the 10 × 10 km grid square (hectad) scale. Records made from outside this range are flagged although the rule-set now has the ability to 'learn' from the decisions made by verifiers i.e. they are updated where records outside the known range are accepted as correct.

- **Identification difficulty**: The second main rule check is the ease with which a species can be identified. All British and Irish plants have been scored on a scale of 1-4 in terms of the identification difficulty as shown in the table below. These categories are taken from Ellis & Walker (2011) and range from (1) plants that can be easily identified by beginners such as Daisy *Bellis perennis* or Dandelion *Taraxacum officinale* agg. to (4) those that are hardest to identify and need to be checked by an expert, such as microspecies of Dandelions, Brambles and Hawkweeds. Species belonging to Level 1 are automatically accepted as correct within iRecord whereas all records of levels 2-4 are flagged as needing further scrutiny, regardless of the expertise of the botanist submitting them.

Level	Description	Examples
1	Species that can be relatively easily identified even by inexperienced recorders using up-to-date field guides. This includes 137 taxa for which records would be accepted from anyone without the need for additional evidence.	*Bellis perennis, Urtica dioica*
2	Species where care is needed for identification (1436 taxa) for which records would be acceptable from a reliable botanist at the local or national level, or from a source that is able to assure that this is the case with reasonable certainty.	*Alchemilla alpina, Poa compressa, Stellaria pallida, Vicia sylvatica*
3	Species that are difficult to identify (1323 taxa) for which a record would only normally be acceptable if it has been checked and validated by the BSBI Vice-county Recorder for the area concerned (or by another regional expert or other authority recognised by the BSBI).	*Ajuga pyramidalis, Carex montana, Lycopodium annotinum, Rosa tomentosa*
4	Species that can only be identified following critical assessment (1825 taxa). A record would only normally be acceptable from an expert in the taxonomic group concerned, or from a person recognised by such an authority. Such experts should be known to the BSBI or its related taxonomic community as a recognised authority on the group concerned. This would include, but not be exclusive to, the BSBI's own panel of referees and experts.	*Hieracium, Rubus, Taraxacum*, most hybrids

- **Flight/activity period:** This auto-check is designed to spot records that fall outside the known period when a species is most likely to be active and therefore recorded, such as the flight period of an insect. For plants, this is defined differently and is simply the years over which a species is known to occur (based on the BSBI distribution data described above). Currently, this means that it will only flag species that have not been recorded for a long time, such as native species that are extinct or rare aliens that have occurred in the past. In the future, it may be possible to improve this auto-check by using information on flowering phenology or its apparency (i.e. the period over which the majority of records have been made in the past).

If a record 'fails' any of these checks then you would see one of the following symbols alongside the record if you were to view it in iRecord in iRecord:

Symbol	Meaning
👍	Passes all rule checks; **OR** No rule checks available for this species
👎	Fails at least one rule, in which one or more of the three following reasons will be displayed:
🔬	Fails on identification difficulty (hover over icon to see details)
🌐	Fails due to being outside the known range
📅	Fails due to being outside the flight/activity period
🚫	Records from this source do not have rule checks applied

These flags highlight records so that NPMS verifiers (see next section) can prioritise records that need to be checked. These can be verified immediately if accompanied by a photograph that confirms the identification as either correct or incorrect. Where photographs are not available then the verifier can use his or her knowledge of the species in an area to come to a decision or where inconclusive, request further information, including a photograph or specimen, from the data provider. The final step is to set a verification status to a record as either 'Accepted', 'Not accepted' or 'Unconfirmed' as shown in the iRecord categorisation below:

Verification status 1	Verification status 2	
Accepted	Correct	✅
	Considered correct	✔️
Not accepted	Unable to verify	❌
	Incorrect	❌
Unconfirmed	Plausible	☑️
	Not reviewed	

The second column provides the verifier with further categories that reflect how confident she/he are with their decision. Marking a record as 'Correct' reflects high confidence due to the submission of a photo or specimen whereas 'Considered Correct' is the most confident a verifier can be without having seen either. 'Unable to verify' is where a verifier is sure that the record is not correct, but they do not have sufficient evidence to absolutely reject the record whereas 'Incorrect' is used when the verifier has evidence of a mistake such as a photograph, specimen or other information from the recorder; in such cases records may be "re-determined" to the correct identification by the verifier, rather than simply just rejected. 'Plausible' is used when a verifier considers that the record is likely to be correct but there is insufficient evidence for a misidentification to be ruled out – in general terms these are considered as 'accepted' but with a low level of confidence, often because they have

been submitted by inexperienced recorders. The table below provides more information on each category:

Verification status 2	Explanation
Correct	The verifier is able to confirm that the species has been identified correctly, usually on the basis of photo/s within iRecord (or specimen/s outside iRecord)
Considered correct	The verifier has not seen photo/s or specimen/s but is confident that the record is likely to be correct, based on difficulty of ID, date, location plus recorder skills/experience etc.
Unable to verify	The verifier is confident that the record is NOT likely to be correct, based on difficulty of ID, date, location plus recorder skills/experience (and where no photo/s or specimen/s are available); or photos are available but do not show enough detail to confirm the identification; and/or the record is not sufficiently well documented to confirm (e.g. location is vague)
Incorrect	The verifier is able to confirm that the species has *not* been identified correctly, or the record is erroneous in other respects, on the basis of photo/s or specimen/s, or on information from the recorder
Plausible	The record is plausible based on species, date and location, but there is not enough supporting evidence for the possibility of misidentification to be ruled out. This is not considered as an Accepted record (and would not be exported to the NBN Atlas for those schemes that link directly to NBN). This can be a good option for ensuring that unconfirmed records from inexperienced recorders can be dealt with without putting the recorder off by giving an outright rejection. Some recording schemes or projects find this category is useful to filter records in or out for analysis purposes, but it is up to your scheme whether or not to use this term.
Not reviewed	The record is in the system but has either not been looked at, or a verification decision not yet been reached

Further information on how records are verified on iRecord is available on the verification recording page.

4. Who verifies NPMS records?

Verification starts with the surveyor as all records are to some extent verified by the recorder. Once they have been submitted then they are checked by expert botanists with good knowledge of the flora of the area, county or region from where the record originated. All verifiers are expert botanists, in most cases associated with the BSBI.

5. How can volunteers help with verification?

One of the best ways to ensure that records are verified efficiently is to include a photograph of the plant in question. This is very easy to do either via the website, or when using the NPMS recording app on a smartphone, where photographs are automatically captured and submitted with the record. When taking a photograph it is important to ensure that the images are in focus and provide close-ups of features that are important for identification such as leaves and flowers.

If you are unsure of the identification, it is often better to seek help before submitting the record as this will reduce the work of verifiers who often have to check 1000s of records each year. NPMS staff will be happy to check photographs for you or alternatively there may be local botanists, including BSBI vice-county recorders, who would be happy to help, especially if the species is potentially rare or new to the area.

6. How can volunteers access and use verification messages?

Once you have submitted data to NPMS then any messages sent by verifiers can be viewed under "Verification messages" option nested under "My data" on the main NPMS website as shown below:
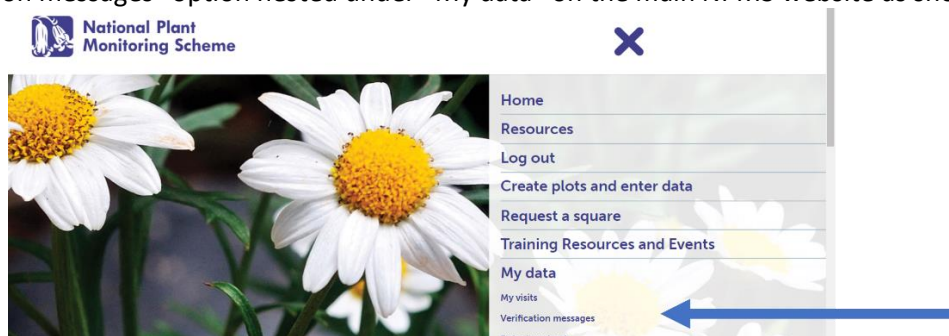
This directs you to the verification page that comprises two tabs. The first tab labelled 'Notifications' provides a list of any automatic or human-provided messages related to specific records as shown in the example below:
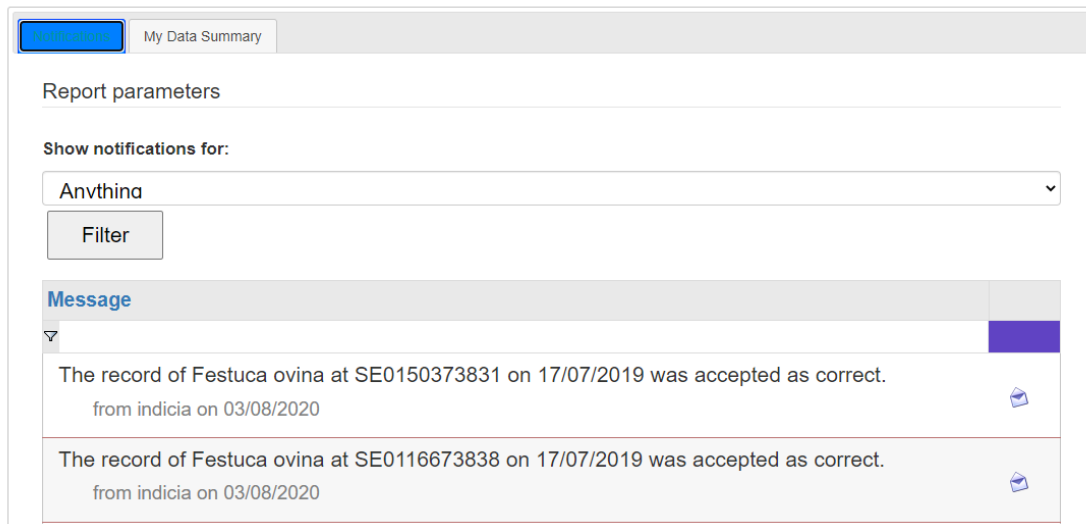

The 'Filter' search allows you to select all messages or filter to just see 'Verifications', 'Rejections', 'Queries' or 'Record comments' as shown below. Where clarification or further information about a record is requested by a verifier, these notifications can be found under the 'Record Comments' filter:
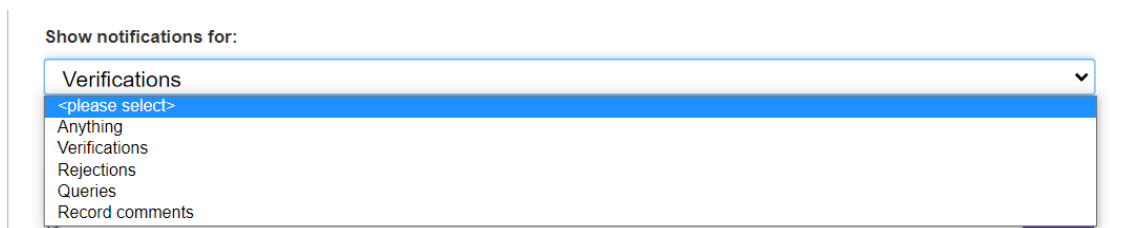

If you have a comment on a record that requires some action (i.e. you need to check and perhaps change the species, or delete the record if you really can't confirm), then you can select the 'edit record' button to the right of the record:
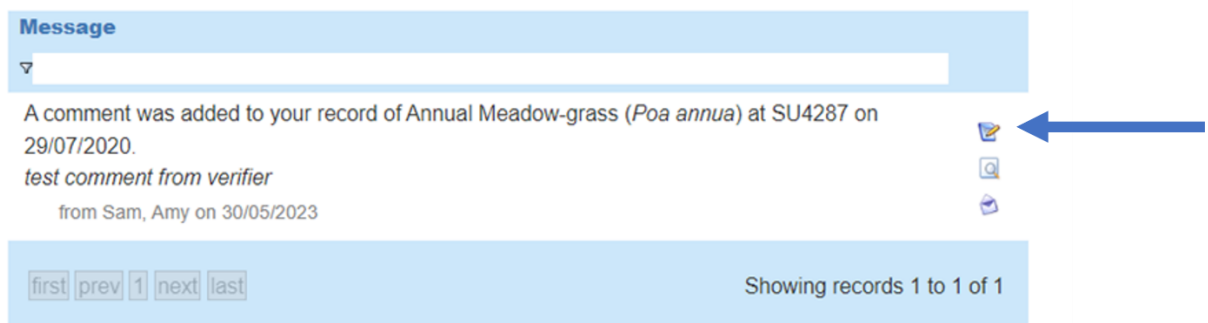
This will take you back to the sample within which the record was made, and you can click through the location and survey details pages to the species page, where you can edit the record or add additional photos. At this point, those who also have an iRecord account can select the 'Need more sophistication? Click here to use iRecord' link, which will take you to the home page of iRecord, where you can navigate to Explore/My records.
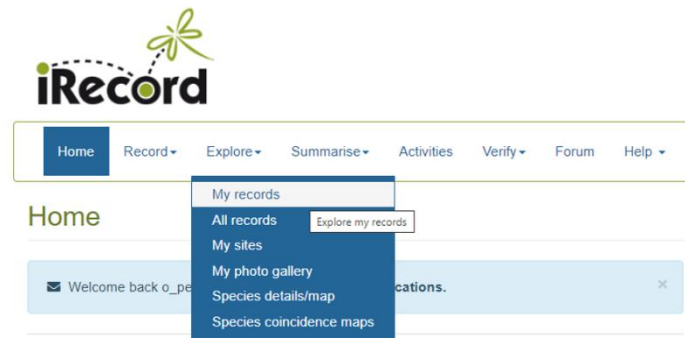
You can then search for the record in question, for example with the species name, location, or grid reference, and/or date. By selecting the 'View record' button to the right of the record, you will be able to add a comment that the verifier will see.
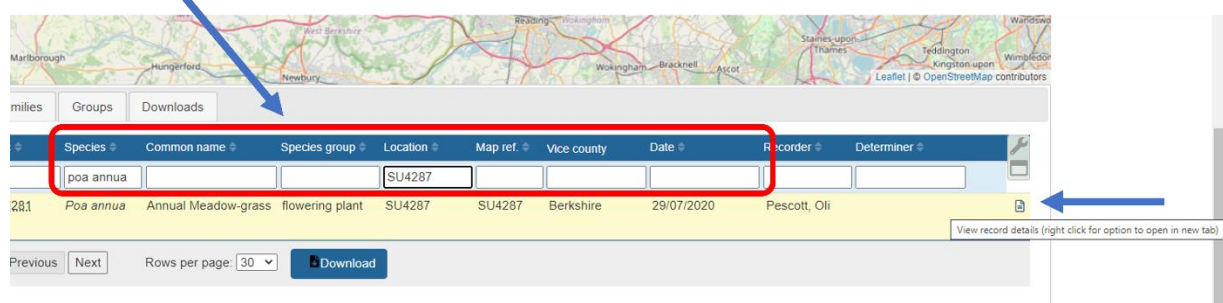
The second tab on the NPMS website verification page 'My Data Summary', provides a summary of the verification statuses of all occurrence records across all your NPMS squares as shown below:

Verification messages

Square Name	Untouched	Verified
NR3590	77	345 (216 human, 129 machine)
SE0173	53	105 (49 human, 56 machine)

first prev 1 next last   Showing records 1 to 2 of 2

The iRecord verification process also allows the verifier to send an email to the recorder through the iRecord system. So, in some cases notifications or questions may also be received by recorders by email; in such cases the email will contain a link back to the record on iRecord to allow the recorder to amend the entry, or to respond to the verifier. If the NPMS recorder does not have an iRecord account, the recorder may have to login instead to the NPMS site to make the required change.

Verification messages often provide important information on records submitted and so provide a learning opportunity for inexperienced surveyors keen to improve their identification skills so please make the most of them!

Further reading

UKCEH, 2020. *iRecord Guidance for verifiers.* Version 5.1. Biological Records Centre, UK Centre for Ecology & Hydrology. https://irecord.org.uk/resources-verify

Ellis, R.W. & Walker, K.J. 2011. *Improving the quality of botanical records available via the NB Gateway*. Botanical Society of the British Isles, London. https://nbn.org.uk/wp-content/uploads/2016/02/BSBI_NBNdataquality_report_2011.pdf