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A tangible embrace with the invisible: How a curator can achieve collections goals in partnership with volunteers and the public

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Abstract

Volunteering and/or citizen science projects allow members of the public to participate in work that is not necessarily within their field of expertise, giving them the opportunity to support scientists, curators, and collections-based work.

Here we present a case study from the Natural History Museum that involved curators and researchers working with botanical collections alongside volunteers and the public. The programme had both scientific and educational goals. The particular case discussed here is a project which has been run during 2013/2014 under the volunteer initiative entitled V Factor, which involved curatorial tasks such as databasing and digitising material from the Museum's diatom collection and transcribing handwritten notes. The end products have included the construction of an open access website focusing on diatoms, with information about the collections, an online media gallery, and digital documents, blogs and information for the layperson or expert. This paper also presents further successes and lessons learnt from the programme and the collaboration.

Keywords: citizen science, collections, curation, diatoms, public engagement, V Factor, volunteers

Introduction: Curation in the age of citizen science

Museums and similar institutions that house a multitude of different collections have the duty to provide access to these resources, either via exhibitions or by providing access to the data and/or specimens via loans and visitors (e.g., researchers, artists, etc). This is especially important for natural sciences research, e.g. for mapping biodiversity, identifying new organisms, preventing loss of biodiversity, and also for the wellbeing of society (further reading at Borgonovi, 2008 and Casiday et al., 2008). More recently, this 'relevance' has been expanding beyond scientists, and there have been many new instruments and techniques used to create a dialogue between science/scientist and public/society, shifting from more passive learning to more active participation.. Public and visitors can now have some opportunities to be present behind the scenes and take part in 'hands on' activities with the collections and materials that may be exhibited, rather than just passing by and photographing and reading the notes and labels from the galleries.

Recent changes in technological platforms can provide access to diverse and readily-available information, e.g. databased collections (Haklay, 2013). These possibilities are encouraging the development of a 'culture of participation' (Fischer, 2011). Citizen science, online volunteerism and crowdsourcing are no longer a trend, but something that is becoming an integral part of the work of various institutions, including museums. Public participation in scientific research is not new (Bonney et al., 2009); indeed, a culture of volunteerism at the Natural History Museum (NHM) was established at the Museum's conception in 1881, and formalised with the arrival of its first volunteer coordinator in the early 1990s. But new technologies are shifting how scientific information can be made easily available, as well as who can engage with it and how. Other projects exist where the public take part (e.g. The Birdhouse Network (TBN; Leonard, 2007), eBird (Sullivan et al., 2009), Cornell Laboratory of Ornithology (CLO; 2014; Bhattacharjee, 2005), Galaxy Zoo (Raddick et al., 2010), The Great Sunflower Project (2014)), and they are achieving multiple goals for institutions and the public.

Help from voluntary contributors has had a large, positive impact on museum research and curation, especially due to recent financial constraints (e.g., Bolton & Cooper, 2010). Such projects have broadened the scope of research and enhanced the ability to collect scientific data (Cohn, 2008). Some citizen science projects have already been remarkably successful in advancing scientific knowledge (Bonney et al., 2009).

Citizen science and volunteering have the potential to create the world's largest research team - an endless resource of motivated, passionate, and empowered people. But projects that yield both scientific and educational outcomes require careful planning (Bonney et al., 2009). There is the need to develop effective standardised protocols and ensure that they are linked with an institution's strategy.

It was in this context that the V Factor ('VF' hereafter) programme was initiated by the NHM. VF is aimed at supporting the museum's research and curatorial work, providing access to collections and data, and increasing awareness of what staff at the NHM do, by getting volunteers involved directly with collections-based tasks and providing face-to-face interactions with the visiting public (Miller et al., 2013). Face-to-face engagement is a current (2015 - 2020) NHM strategy, part of the original legacy to 'benefit the public as well as the expert naturalist' (Trackray and Press, 2001). The VF model specifically makes the collections accessible for the external scientific, and non-scientific, community.

The aim of this paper is to publicise the collaboration and share lessons learnt so that the VF framework and techniques could be adopted and adapted by others to achieve not only curatorial but also educational and scientific goals. Also provided is our celebration of the achievements and possibilities for further accomplishments as a result of this endeavour. It provides evidence that the general public (possibly untrained and non-specialist) can gather and transfer scientific data of good quality, and help towards management of the collections. This challenges the perception (anecdotally heard amongst some curators and collections managers) that most of the core curatorial work cannot be done using a 'citizen science style' approach. This is due to the nature of the tasks and responsibilities involved; therefore, it is not a very common arrangement for volunteers to take part and support core curatorial work, which may require decision-making, except for some elementary tasks (e.g., reboxing, relabelling, sorting).

The term 'citizen scientist' is usually used to describe those who participate in scientific research projects and carry out 'citizen assisted science' projects, designed to support and expand science (Rossiter et al., 2015). The project discussed in this paper (Diatoms: making the invisible visible) was designed to provide curatorial support ('citizen assisted curation') for future research purposes. Curation in the NHM is considered to be a means to maintain and care for the collections. We believe that the experiences shared here may change this perspective so that citizen science methods can be successfully employed in many curatorial tasks. What follows is a consideration of the tools that can be used to ensure success.

Methodology

1. Construction of a programme: How VF came about and how it works

VF is one strand of the NHM volunteer programme. It is inclusive, open to anyone 18 or over who is available to take part for one fixed day per week for ten weeks. The programme was initiated in 2012 and has been running continuously since that time. It is a way in which the NHM can increase public engagement with collections, and improve access to collections, information, and expertise – a major NHM aim. In addition, it can educate and entertain some of the five million visitors per year that pass through the Museum's doors. Finally, it is a novel approach that can promote staff development and help to redress decreasing resources.

The initiative takes place in the Specimen Preparation Area (SPA) of the Darwin Centre, a lab on view to the public (Figure 1). Specialist scientific staff and a volunteer coordinator manage the programme, assisted by volunteer leaders. The area was designed to bring NHM science and collections to life: real science, real collections, and real experiences. This is also what makes the space and the programme so unique in its approach and challenges. Further details about the VF programme can be obtained from Miller et al. (2013).

Figure 1. View from the public galleries into the SPA lab (Specimen Preparation Area, Darwin Centre).

The public seem to look for and value face-to-face interactions and 'hands-on' activities in many museum locations. For those unable to attend a museum, there are now also possibilities associated with remote volunteering and citizen scientist participation offsite or from home. Amodio (2008) has stated that, to face these needs, museums are implementing a vast array of instruments and applications. The VF initiative involves a number of fairly short term projects, each a year-long collaboration, that involve working directly with potentially fragile natural history collections. For others less able to contribute in this way, a crowdsourcing element was introduced.

Falk and Dierking (2000) have highlighted how 'mediators' (explainers) play a critical role in personalising a museum experience for visitors, facilitating their efforts to learn and find meaning. According to Bonney et al. (2009), an educator is required for a citizen science project, to explain the project's importance and significance to participants, to pilot and field-test protocols with potential participants, to develop clear and comprehensive project support materials, and to ensure appropriate participant feedback. In the NHM there are Science Educators who can discuss individual objects/specimens and wider issues with visitors. However, VF goes further in showing the science and curatorial work currently being carried out by museum staff, highlighting the Museum as a research institution. VF may not appear, at first sight, to be a traditional citizen science scheme, but it does demonstrate what goes on behind the scenes. It also allows for non-scripted conversations/ interactions with the public relating to our science and collections. Props and activities are designed to suit the wide range of visitors.

VF collaborations are thus designed to provide suitable support (personnel and planning) to meet the objectives of both the NHM and the persons (curators and/or researchers) involved. This encompasses a considerable amount of preparation, as described below.

2. Putting together the Diatom project: Making the invisible visible

A VF project could involve sorting, observing, studying, measuring, cataloguing, etc., so long as it has clearly-defined and desired outcomes for a researcher/ curator and the volunteers taking part, as well as the Museum. The project discussed here was the second collaboration carried out under the umbrella of VF, and focused on the NHM's extensive diatom collection. It was carried out in 2013 – 2014. Diatoms are microscopic photosynthetic aquatic organisms (also called 'algae'). The collection includes glass microscope slides with wide temporal and geographical area representation, archival handwritten notes, drawings and illustrations, and photographs of diatoms. Information relating to a particular object/specimen is contained in more than one 'material' (i.e. slide and handwritten notes). The various aspects of this collection had not been brought together due to historical and human resource issues. The aim of this VF collaboration involving diatoms was to digitise a set of the diatom collection material, more specifically, the collection of the Victorian naturalist Thomas Comber.

Digitising vast amounts of data extracted from different types of collections and artefacts, and cross referencing and linking this information, can be labour-intensive. Activities involved included virtual archiving, (i.e. capturing and transcribing data from slide labels and handwritten notes), creating digital surrogates (i.e. digital copy that works as a substitute and/or replacement), and carrying out quality assurance. Although this could be done by a digitiser together with a curator, we wanted to actively engage passionate, interested volunteers accompanied by experts for this work.

The strength of any citizen science programme relies on the curiosity and pleasure associated with learning (Devictor et al., 2010). Diatoms are not widely known by the public, and thus might not be an immediately appealing subject. Moreover, they are invisible to the naked eye. However, through the theoretical and practical aspects involved in the VF framework, the diatom project easily provided curiosity and pleasure: the volunteers were captivated not only by the training and information packages they received, but also by their involvement in processes such as decoding and transcribing genus and species names from often illegible or abbreviated handwritten sources. Some of the species names caught the volunteers' attention, and they became interested in seeing some of these invisible 'creatures' and learning the meanings of their names. This included species named after a person, feature, or locality, e.g., *Aulacodiscus comberi* (homage to T. Comber); *Navicula communis* (very common species, found everywhere); *Biddulphia novazeilandica* (from New Zealand).

In the view of Bonney et al. (2009), a citizen science project should have: a) set-up protocols, b) data forms, c) supporting educational materials (hand-outs, guidelines, tips, etc), d) opportunities for training, and e) a view of the data gathered. The diatom project presented here fulfilled many, if not all, of these criteria. The project relied principally on three members of Museum staff: the volunteer coordinator plus two members of the diatom curation team. The project also benefitted immensely from the invaluable assistance of volunteer leaders. These are volunteers who have a deeper understanding of the work, and a longer-term relationship with the Museum. This group are committed to VF, and bring initiative, creativity, and depth of experience to the framework and day to day operation of the programme. For example, they are instrumental in preparing props for the public discussions outside the lab. Since diatoms are invisible to the naked eye and the public cannot touch or listen to them, they are difficult to present to visitors. The volunteer leaders helped make the invisible visible.

3. Establishing protocols

a) Organising training modules and packages

As noted by Bonney et al. (2009), developing and implementing public data-collection projects yielding both scientific and educational outcomes does require significant planning and effort. The VF framework is designed to meet the project ambitions and give back to the volunteers, whilst also benefitting the public and the scientists/curators carrying out the projects. The investment made by staff was quickly rewarded by the volunteer output in producing results (i.e., data). Many of the suggestions here may sound obvious, but they are necessary because museum professionals often take them for granted.

The VF framework (training modules and some content; more details in Miller et al., 2013) has been re-used as the foundation for each collaborative project delivered under VF. However, some aspects are changed or adaptated to fit the project goals and tasks. For the diatom project, it was important to decide how best to convey the science, the rationale behind the project, and the nature of the tasks involved. In order to have an efficient training package/framework and, consequently, effective outcomes when planning such a project, several factors need to be considered:

- Opt for a simple and easily understood database entry programme, preferably one that would auto-populate fields to minimise the capacity for human error, and the addition of recommended links to undertake searches quickly and simply. We used Microsoft Excel, rather than the in-house database system, as it is user-friendly for the volunteers and easily adaptable for museum professionals to assess quality. It is also easy for data to be transferred to other types of data management system. One needs to also consider that there might be people with very basic computing skills, and it is also important for them to see what they are doing and undertake the task readily.
- Create simple exercises with step by step examples of what is needed to be done and why, to be used on the first day/s to familiarise the new volunteers with the workflow expected. This helped to show the logic, reasoning, and context of what was to be done.
- Have and make available extra resources and sources of information that enhance and reinforce training and knowledge (e.g., in our project: risks to the collections and possible ways to mitigate the risks; how to prepare a slide, etc.). This helps to communicate the reasons behind each task or guideline, illustrating why it is important and how it all started. It instigates curiosity, and expands the volunteers' views and skills, which could be linked to their day-to-day life (see further examples below).

b) Transferring knowledge

Riesch and Potter (2014) describe citizen science projects where attempts have been made to discover learning outcomes and ways of delivering useful information. Evaluation is embedded into the VF framework, to ensure that participants are making

full use of their time and working towards the goals of the project. Importantly, the evaluation also reflects on the enjoyability and productivity of the volunteer experience. Thus, all VF volunteer participants were asked for an evaluation every other session. Learning was captured via quizzes in the final session of the ten weeks, with activities such as mind mapping (in sessions one and ten), and with 'building-blocks' (hand-outs and other information) to reinforce learning.

One good example of transferring skills and knowledge is that the volunteers are usually asked to bring in one or two objects of their choice, which are used throughout the 10-week term. These are used to explain concepts such as collecting, labelling, curating, caring, rules of access or handling/using, alongside other skills such as communication, organisation, taking instructions, punctuality, as well as the notion of what being a curator entails. During the databasing activity, we gave the volunteers learning opportunities on troubleshooting, interpretation, and decision making (e.g., which species is being referred to; which to choose if something is missing, etc.).

c) Dealing with issues

i. Commitment

Experts/scientists/curators might have concerns about how to interest people in signing up for VF, and then how to maintain their interest during a project. Promotional material was prepared to help in this regard. Factors such as insights into the collections and the Museum, face to face contact with curators/researchers, hands on activities with real and historical collections, and development of skills and knowledge were mentioned. It was acknowledged that one of the main benefits of VF is that volunteers are present in the Museum where they meet staff, the public, and other volunteers. D'Souza et al. (2011) mentioned that the social factor seemed be one of the significant reasons why people sign up for volunteering or a similar commitment. We are not clear if this was one of the main reasons, but some individuals stated that they enrolled mainly to get a 'behind the scenes' opportunity and to be involved with scientists and natural history collections. It is believed that providing some details of what was expected of volunteers, and what they would be working on, probably helped potential participants to decide whether or not to sign up.

ii. Credibility of the data

Riesch and Potter (2014) showed that the subject of data quality worried most scientists involved with citizen science, although it did not pose a total stumbling block for their enterprises. Others have addressed similar issues. For example, Bonney et al. .(2009) have written that the creation of accurate data depends upon providing three things: (a) clear data collection protocols; (b) simple and logical data forms; and (c) support for participants to understand how to follow the protocols and what to do if in doubt. Riesch and Potter (2014) listed some of the approaches that have been used to ensure that errors in data quality can be minimised.

The project discussed here had some 'problematic complex' elements that the curators and volunteers would be faced with, aside from databasing. These were tasks such as extracting information from handwritten notes, transcribing taxonomic names, and doing repetitive tasks involving unfamiliar microorganisms. The volunteers might have also felt under pressure to keep specimens safe, as they were all incredibly fragile. Poor data quality and high risks to the collection were considered to be problematic by the curators in the diatom project, but they did not prevent the decision to go ahead. This collaboration is proof that it is possible to involve potentially non-specialist and previously untrained members of the public in curatorial work and have a positive outcome.

In this project, the database was created from handwritten notes, so steps were taken to assist deciphering and transcribing. In addition, human error was avoided, whenever possible, by using drop-down lists and online databases for reference, such as California Academy of Sciences Diatom Collection Database (http://researcharchive.calacademy.org/research/diatoms/names/index.asp). Also, the data-entry programme, Microsoft Excel, helped to 'monitor' the data captured by flagging possible mistakes. Finally, quality assurance was carried out by the curators throughout the year-long run, and on completion of the project. Checks and data entry monitoring were executed during the time the volunteers were doing the tasks. Further elements of quality assurance were performed at the end of the 10-week block, as the data produced by a team needed to be consolidated with the data produced by the previous team. This was carried out by the curators and volunteer leaders.

This protocol follows some of the recommendations of Riesch and Potter (2014). For instance, the curators offered training, mentorship, and close supervision, whilst encouraging volunteers to cross-check each other's data during the first three weeks. Face-to-face support for queries was considered essential to ensure a smooth operation and high quality data collection. The processes of reading, searching, checking, copying, confirming, learning where to look for answers, how to compare and/or revise, and how to redo and/or correct if a problem arose, are 'building-

blocks' of knowledge, skills, and confidence.

Although some errors should be expected, and some are unpredictable and/or missed, many can be anticipated, and therefore protocols and processes can be put in place to minimise them. Most of the errors occurred due to the fact that some collections may have inherent problems (e.g., labels with misspelled names, obscure localities, out of date taxonomy).

iii. Handling collections and fragile material

To minimise risks to the collections, such as breakage, misplacing, damaging, losing, effective protocol training was provided. Again, the volunteers' own material was used and imaginative situations (e.g. damage, loss, etc.) were presented to them so that they could reflect on the consequences, such as specimen replacement, or misplaced labels. Other risks were also explored and discussed, and minimised by providing the volunteers with protocols (e.g., how to scan fragile documents, avoiding food in the area, etc.).

Figure 2. View from inside the SPA lab with volunteers carrying out databasing.

Results and Discussion

The VF volunteers came from various educational (basic/A-level to PhD), employment (cashier, house-wife, professional) and nationality backgrounds (UK, Japan, Italy, Spain, etc.). On average, each VF volunteer processed 13 slides per session, with no breakages or damage to the fragile handwritten notes or slides (Figure 2). They sometimes spotted problems themselves that had passed through unnoticed (e.g. missing or misplaced handwritten notes, or geographical information wasn't matching, etc.). On a typical (non-holiday) day, the Volunteer Leaders had on average 12 interactions with members of the public (from single individuals to large school groups) outside the SPA, each for approximately 12 - 20 minutes.

Using the methodology defined here, the following results have been achieved:

Volunteer and staff outcomes

There has been no shortage of applicants, and those selected continued to be useful throughout the duration of their time at the Museum. VF projects at the NHM are run in-house, so there is no need for a strong publicity campaign to attract participants (as suggested by Rossiter et al., 2015). Although the numbers signing up for VF were large - we received well over 80 applications for this collaboration - we limited the participants to eight per 10-week session, to best meet the needs of the project and the volunteers, and ensure a quality experience for all.

The volunteer participants demonstrated their satisfaction with the diatom collaboration through the evaluations offered to them. Here the average rating was 8 out of 10 for their overall personal benefit and enjoyment from the initiative.

Learning has been demonstrated. For example, the mind mapping exercises carried out (which included the questions 'What is the role of a Museum?' and' Why it is important to make accessible the collections?') showed that, between week one and week 10, the answers expanded from 10-14 to 25-30 associations. The vocabulary in session 10 included words such as 'research', 'curation', 'conservation', and 'taxonomy', while on the first session there was 'curiosity', 'fun', 'escaping from rain or cold days', 'entertainment', etc. This shows that there has been a much improved participant understanding of science processes, curatorial needs, and collections care.

Volunteers were able to create accurate and meaningful results. By the fourth session, queries or doubts were often sorted out between volunteers themselves. Having a simple task design was one of the key factors for diminishing errors. Also, having extra tools to empower them and help problem-solving, searching, making decisions, and entering data contributed to faster and more reliable inputs. In fact, data quality issues have been estimated as being

problematic for only 10% of the data gathered, and the problems were mostly related to excessive and unnecessary information or orthographic errors, rather than incorrect data or wrongly-transcribed information. With regards to digital images, some of the problems occurred when material was imaged with other papers or notes close to, or underneath, the handwritten notes, producing an image of the document that did not meet the desired standard. Quality checking exposed the high quality of the work achieved by the volunteers. This certainly was the result of a well-designed, step-by-step task, coupled with establishing a solid protocol, workflow and training.

It has been acknowledged that crowdsourcing platforms are expanding rapidly (Fitzpatrick, 2012), and that their involvement in less obvious or well-known projects is increasing (Cohn, 2008, described as 'less interesting' projects, which might mean those with very repetitive and uniform tasks, for instance, counting and marking the number of objects/items from an image). The project discussed here involved diatoms, which are not well-known organisms and cannot easily be seen, which could render it a less attractive endeavour. The project aimed to make the invisible (diatoms) visible for the volunteers and the public. The volunteers, and in turn the visiting public, also learned of the organisms' importance (e.g., production of oxygen, basis of the marine food chain, usage in filtering processes, etc.). The collections themselves might not be colourful or attractive, and some tasks were rather repetitive - as most databasing tasks are - but appreciation of diatoms and the Museum's collection grew among the volunteers as the project progressed. This was demonstrated by the volunteers expressing interest in seeing what the organisms looked like, especially if they had come across a species name that they could relate to their day-to-day life.

The project developed collections-related skills and produced improvements in confidence and employability for the volunteers and internal staff members. Cooperative learning and support skills were also gained by all involved. Three VF volunteers joined our Volunteer Leader team, and seven others signed up for further volunteering elsewhere in the Museum (as of 2014). The Assistant Curator on the project was promoted to Curator in August 2015, as the VF opportunity enhanced and developed further his competencies for collections care and management.

Curatorial outcomes

The project focused on the Thomas Comber diatom collection, and produced many direct curatorial outcomes:

- All the slides (c. 3000) were databased and the associated notes scanned/digitised (c. 3500).
- T. Comber's geographical notebook has been digitised and its data transcribed, with some places and/or localities being traced and an updated name and/or political geography annotated. About 948 different localities have been listed and updated, following data protocols already established by other digitisation projects. This information will be part of the geographical data list in the NHM database.
- The bottle collection (c. 300 bottles) associated with the T. Comber diatom material has been databased, and when related to a slide, this connection (cross referencing) has been made.
- The T. Comber collection (i.e., slides and bottles) has been audited, with its condition reported and required remedial conservation work listed. Some cases have already been addressed.
- There has been an increase in both scientific and non-scientific enquiries relating to the diatom collection and the T. Comber material held at the NHM. Some of the material will be part of a project with international collaboration.
- Improvements are now in place in the operational and management aspects of these collections, so that there is more efficient and effective access to the T. Comber collections.
- Improvements have been made in the documentation and contextual information of the T. Comber collections (e.g. further material being linked to this collection).
- The portal 'Diatoms Online' (http://diatoms.myspecies.info/), which was established in association with VF and is currently in the process of being updated and changed, is now an extra source of information for the collection and its specimens.

Additional outcomes

- A Sci-Art workshop focusing on diatoms (function, form, structure, use, value and beauty) took place together with Central St Martin's School of Art & Design, in which the artists were asked to create or design a 3D representation of these organisms. The winners had their pieces on display at the NHM.
- The Blackheath Embroiderers' Guild created a piece of artwork based on diatoms, which was displayed in the SPA lab.
- A talk was given at the Citizen Science Cybersummit

(21 February 2014) at University College London, on 'Citizens, Science and Education'.

- External showcases were given to representatives of the National Museum of Science and Nature in Tokyo and Chapman University (US) in 2014.
- 'Digital volunteering: a case study on V Factor and Diatoms' is available from the Museums Association website: http://www.museumsassociation.org/museum-practice/new-approaches-to-volunteers/your-volunteer-case-studies.
- A poster ('Increasing engagement with collections through inclusion programmes: an example from The Natural History Museum, London') and a talk was presented during a workshop held at Manchester Museum in December, 2014
- A public open day was held in the Specimen Preparation Area at the NHM in July 2014 to celebrate 'V Factor: a year-long collaboration with diatoms'. We welcomed 45 visitors and 25 staff members.
- There were two in-house seminars for staff on completion of the collaboration, to report on successes. One focused on Diatoms Online, and the second on 'V Factor: A yearlong collaboration with diatoms'.
- A water sample with diatoms from the NHM Wildlife Garden was included in the 'Museum of Water' exhibition at Somerset House, London, in June 2014.
- Some material from New Zealand has been examined by an internationally-renowned artist, who produced a small exhibition in New Zealand, which accompanied a published booklet.

We are therefore able to state that we reached and exceeded all of the curatorial goals set for the project. Included in this was the aim to have all the slides in the T. Comber collection databased and the associated material digitised. This shows that the VF framework can work, and confirms Cohn's (2008) conclusion that involvement with 'less interesting' projects can be made appealing if it is explained what the organisms are, why they are important, and why the project is relevant to the museum and the scientific community. This makes clear to the volunteers that their efforts and dedication are worthwhile.

Further work

There is still some work to be done to achieve the full spectrum of collections management and access goals for this particular set of collections. For example, there are photographs taken by T. Comber that have not yet been curated, and some of these are related to the slides. Links should be determined and images taken, to obtain optimum quality. There are also lantern slides of the photographs that could also linked to the data, and the potential of this material as a resource reviewed, so that they could be more useful. These lantern-slides demonstrate how specimens were recorded in the past, in addition to drawings and illustrations, so it would improve links to the historical aspects of this collection. It will be very important to have images of the species that have been databased and linked to particular slides, projects, or Type material. Whenever possible, and material is available, it would be useful to recreate the morphological information (e.g, create new slides and/or use the SEM from the bottle collection, especially for the Types).

It will be also important to clarify the taxonomy and nomenclature, particularly of the Type specimens recorded in this collection, and also check the publications or protologues for those slides where T. Comber noted that there were Types, as they might contain new species that T. Comber didn't have time to publish or describe.

In order to maximise on the research outcomes of a collaboration of this kind, it would be helpful to georeference the localities. It would also be useful to ensure that all the names listed in T. Comber notes for each slide were made searchable online. So far, only one name/species is listed per slide, in order to link and represent the slide.

Conclusion

We believe it is worth re-emphasising a few aspects when proposing a similar project:

- Establish the project involving a team where volunteers could also take part and have a say, including testing beforehand.
- Ensure a continuous investment and review of the protocols and processes, and ask the volunteers what they think.
- Provide an immediate response to enquires and doubts, and share the responses so that the skills and knowledge are transferred.
- Develop a project and standards that can be re-used by others and in other locations.
- Illustrate, record, photograph, video-record and/or document all the processes undertaken.
- Celebrate the value of volunteer engagement in meeting the objectives of the project.
- Acknowledge the activities being carried out

internally and externally (e.g., on the web) at regular intervals, not only at the end of the project.

Finally, we would like to find funds and/or volunteers to continue this work and perhaps tackle other collections, which are at least equally as important as that of T. Comber. Anyone who is interested, or has other ideas, is invited to get in touch with the authors.

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