29

Citizen science and the role of natural history museums

Andrea Sforzi[1], John Tweddle[2], Johannes Vogel[3], Grégoire Lois[4], Wolfgang Wägele[5], Poppy Lakeman-Fraser[6], Zen Makuch[6] and Katrin Vohland[3]

[1] *Museo di Storia Naturale della Maremma, Italy*
[2] *Natural History Museum London, UK*
[3] *Museum für Naturkunde Berlin, Germany*
[4] *Muséum National d'Histoire Naturelle Paris, France*
[5] *Zoological Research Museum Alexander Koenig, Bonn, Germany*
[6] *Imperial College, London, UK*

corresponding author email: direzione@museonaturalemaremma.it

In: Hecker, S., Haklay, M., Bowser, A., Makuch, Z., Vogel, J. & Bonn, A. 2018. *Citizen Science: Innovation in Open Science, Society and Policy*. UCL Press, London. https://doi.org/10.14324/111.9781787352339

Highlights

- Historically, natural history museums (NHMs) have a long history of collaboration with the amateur-expert naturalist community. A tradition of two-way knowledge sharing that continues today.
- Over time, NHMs have renewed their functions within society and assumed a relevance not only for the conservation of collections, but also for engaging society in the generation of new scientific awareness and understanding of the natural world.
- Natural history museums now deliver a wide range of field-based and online citizen science projects and play a central role in supporting the development of citizen science and citizen scientists.
- Natural history museums have also taken a central role in establishing the European Citizen Science Association (ECSA) and are well-placed to both promote the field of citizen science and support capacity building within critical subject areas such as taxonomy.

Introduction

The study of nature and the environment by amateur natural historians pre-dates both the professionalisation of science and modern definitions of the term 'citizen science' (e.g., Silvertown 2009; Bonney et al., 'Public Participation', 2009). In some parts of Europe, volunteer-led gathering of observations of wildlife ('biological records') and specimens has a long and illustrious history and this continues today (Silvertown 2009; Roy et al. 2012; Pocock et al. 2015; and see also Mahr et al. in this volume). A significant level of taxonomic expertise is contained within this community: a recent study demonstrated that over 60 per cent of the 770 new species discovered on average each year in Europe since the 1950s are described by non-professional taxonomists (Fontaine et al. 2012).

Since their establishment, NHMs have worked closely with these amateur-expert communities, with many NHMs being founded – and their scientific collections subsequently developed and maintained – with the invaluable support of enthusiastic, highly skilled amateur naturalists. Similarly, long before citizen science became the widely publicised concept of today, NHMs, other academic organisations and amateur naturalists worked together to build understanding of the breadth and dynamics of a country or region's biodiversity (see Miller-Rushing, Primack & Bonney 2012). One of the earliest examples of such collaboration is the Christmas Bird Count: initiated in 1900 by the American Museum of Natural History ornithologist Frank Chapman, this project has subsequently developed into the longest-running active citizen science project (National Audubon Society 2017). Since the initiation of this formative project, NHMs and amateur naturalists have collaborated on diverse programmes, from co-ordinating national bird ringing initiatives to the production of national species distribution atlases. This long history of amateur-professional collaboration through the spontaneous evolution of sound partnerships continues today.

Over the past two decades, however, NHM-led citizen science programmes have undergone a rapid and marked increase in both number and diversity, with a wide range of project types and collaborations being developed alongside these more traditional activities. In part, this change mirrors the wider expansion of the global field of technology-mediated citizen science (e.g., Roy et al. 2012; Pocock et al. 2017; Novak et al. in this volume). Critically, though, it also reflects the two synergistic and shared goals of museums and citizen science: the generation of new scientific understanding and education (Ballard et al. 2017).

Many NHMs have recently undertaken the ongoing, and in some cases quite profound, transformation of the organisation of their core functions and the ways in which they interact with visitors and local communities. Alongside their traditional roles of conserving and providing access to specimen collections, NHMs are increasingly looking to actively engage members of the public in projects that seek to build understanding of the natural world. They have expanded and diversified their public-facing work to encompass the development of new educational approaches and tools that seek to engage broad sectors of society with the science of natural history.

This increased emphasis on societal engagement reflects two key factors:

1. Museums – and national museums in particular – are increasingly driven by the need to maximise their public value and impact across society and over large geographic areas. This includes reaching and engaging non-traditional audiences and people that cannot physically visit the museum itself (e.g., Robinson et al. 2016).
2. Growing recognition of the importance of actively engaging wider society with the key biodiversity challenges of our time, from understanding the impact of environmental change, to building awareness and knowledge of the critical role that nature plays within society, and developing effective conservation practices.

Citizen science is a central approach through which many NHMs are seeking to tackle these challenges. As a methodology, it is an effective way to combine the scientific and educational remits and expertise of museums. It makes full use of their wide audience reach and trust (Ballard et al. 2017) by directly involving people with museum collections and cutting-edge research on key socio-scientific challenges.

This chapter illustrates how European NHMs are seeking to support the development of citizen science and citizen scientists as well as some of the key forms of NHM-delivered citizen science. It concludes by summarising factors influencing the success of citizen science in a museum environment, the challenges and next steps.

The following sections outline four of the most common ways NHMs are actively contributing to the field of citizen science.

Supporting the development of amateur-expert naturalists

Citizen science includes a broad range of potential participants, from untrained members of the public with limited subject knowledge, to practitioners whose expertise is equivalent to that of professional researchers. Whilst NHMs often look to support this spectrum, there is often emphasis on supporting amateur-expert naturalists and taxonomists to develop and share their faunistic and floristic knowledge, such as identification and field skills. These areas are otherwise facing a profound skills crisis (Cutler & Temple 2010; e.g., Boxshall & Self 2011) at a time when the demand for the biological monitoring and conservation assessment of habitats and species is increasing (Collen et al. 2013; Owen & Parker in this volume).

Museums directly support amateur-expert citizen scientists in diverse ways, from providing access to resources such as reference specimen collections, libraries, meeting rooms and technical equipment; to archiving personal specimens, herbaria and book collections; to direct scientific support, training and mentoring in species identification, field survey and research methods. Creating opportunities for amateur and professional naturalists to interact and share their skills is key to these activities, to mutual benefit.

Non-governmental organisations (NGOs), such as regional natural history associations, are common in many European countries but many face recruitment problems, arguably because school biology classes – and increasingly universities – rarely include teaching units on species identification or local biodiversity. Young scholars have few opportunities to experience the joy of discovering biological phenomena or interesting organisms in nature, and schoolteachers rarely receive training in faunistic and floristic studies. The demography of many natural history societies is ageing as a result (e.g., Hindson & Carter 2009). In more specialist societies (e.g., entomological groups) in Germany, the majority of members are often older than 50 years of age and male. Programmes are therefore needed to train the next generation of naturalists and diversify this demographic. In the UK context, NHM London's Identification Trainers for the Future programme (www.nhm.ac.uk/take-part) is one such project.

Natural history museums can help to develop an out-of-school/university curriculum for interested scholars. They can provide space, books and microscopes, while NGOs contribute experts for taxonomy and environmental assessments where this expertise is not available in-house.

In Bonn, the Zoological Research Museum Alexander Koenig (ZFMK, a member of the Leibniz Association) runs a series of junior research clubs. There are four age classes for young people aged between 8 and 18, who work in the museum at weekends. Initially they (playfully) learn the difference between animal groups (e.g., reptiles, amphibians, insects) and take environmental samples (e.g., in creeks and lakes). The older age groups work on comparative morphology and taxonomic tasks. As well as imparting biological knowledge, this direct experience of taxonomy and fieldwork can help to demonstrate the relevance of natural history as a pastime and career (www.zfmk.de/en/research/education).

Hosting biological recording schemes and developing species monitoring projects

A key issue for launching biological recording schemes – long-term species observation and recording initiatives – is ensuring that they are financially and practically supported over a substantial period of time by key stakeholders. In the UK and Germany, many of these schemes are entirely run by volunteers or NGOs, who lead on identification training and data collection, collation and verification. Data storage and analysis support is often provided by the national biological records centre (e.g., Pocock et al. 2015). In France (where national NGOs were not available to manage national monitoring initiatives), the Muséum National d'Histoire Naturelle Paris (MNHN) started to support national recording schemes as a significant component of its citizen science programme, playing a lead role under its obligations to the joint authorities of the Ministry of Research and the Ministry of Environment. Monitoring started with birds, as the museum holds the French bird ringing scheme. In 1989, the MNHN launched a national Breeding Bird Survey (BBS) based on point counts, and a constant effort site-based, capture-mark-recapture study led by amateur ringers (Julliard, Jiguet & Couvet 2004).

In Paris this model was subsequently adapted to encourage a less experienced audience and incorporate public surveys of garden butterflies, snails, bumblebees and birds (see also Peltola & Arpin in this volume on an identification project with city gardeners in Grenoble). SpiPoll, a photographic survey of flower-dwelling insects, and a survey of wild plants in city streets were also introduced in 2010 and 2011, respectively. All of these schemes are co-ordinated by the same scientific team based at the museum, but each also relies on a specific NGO partner to play a key role in supporting participants.

As well as gathering scientific data, these schemes provide learning opportunities for participants. Within the SpiPoll project, participants' identification accuracy was found to significantly increase over time, with web tools supporting learning about the key identification features of invertebrates (Julliard 2015, pers. Comm.). There were 1,300 participants, of which only 43 per cent declared 'to know about insects prior to commit in this program', and a recent study has shown that identification accuracy rates increase with experience (Elise Elwood, pers. comm.). Photographs of 630 insect taxa, identified by participants and checked by experts, started with a poor success rate of 50 per cent but subsequently increased by 7 per cent for every 10 identifications a participant made.

The NHM London has also developed a wide range of mass participation biodiversity monitoring surveys, which have collectively engaged over 64,500 people since 1996 (Ballard et al. 2017). Between 2009 and 2014 NHM London was a key partner in the highly successful OPAL programme, which launched seven national citizen science surveys and held a number of BioBlitz events across the UK (see also Makuch & Aczel in this volume). A BioBlitz is a public-facing event that aims to discover as many species of living organisms as possible, within a set location over a defined time period, usually 24 hours. The national surveys studied a range of taxa including earthworms, lichens and invertebrates as bioindicators of environmental condition. Surveys were developed in collaboration with 13 OPAL partner organisations and a range of supporting organisations, including voluntary natural history societies, research institutes and government agencies. OPAL is funded by the UK National Lottery and in line with funder priorities has a strong focus on engagement and participation, especially with traditionally less-engaged audiences (Davies et al. 2013).

Data from many of the national surveys have been published in peer-reviewed journals indicating the wider research contribution of this kind of citizen science data (Fowler et al. 2013; Seed et al. 2013; Bone et al. 2014; Bates et al. 2015). OPAL also introduced many new people to the process and value of biological recording, in particular through online resources and data entry, and a country-wide network of community scientists who delivered training and events, and supported new participants (Davies et al. 2013; Barber et al. 2016; Davies et al. 2016). As a trusted voice of authority, nationally recognised brand and much-loved institution, NHM London played a key role in OPAL as the public face of the project, leading on media and publicity, public events and exhibitions, and taxonomy.

A key outcome of the OPAL project was open source software designed to enable naturalists to create their own biological recording website (Indicia 2016). Inspired by the OPAL model, this software was subsequently used by the Maremma NHM (Grosseto, Italy) to set up a recording website for public surveys (www.naturaesocialmapping.it). The platform is used to collect fauna and flora sightings, as well as to develop national species inventories. A leading example is the national survey of the crested porcupine (*Hystrix cristata*), a large rodent currently expanding its range in Italy. The national survey collected public sightings to reconfirm the presence of the species within its historical range and to map newly colonised territories. Contributors included wildlife enthusiasts, first-time citizen scientists and wildlife professionals. Most sightings were accompanied by pictures of road-killed animals, quills, faeces or tracks. Given its peculiar body structure and distinct tracks and signs, the crested porcupine is easily recognisable and almost impossible to misidentify. Nevertheless, data are verified by project experts before being added to the main database. The data has allowed the creation of the first live map of the species, educating people about native and non-native species (Mori, Sforzi & Di Febbraro 2013). Feedback to participants also includes access to a private area of the website containing the lists and pictures of all the sightings and a personal, automatically updated map. There are plans to engage repeat participants by communicating the importance of regular monitoring.

A key example from Germany is the German Barcode of Life Project (GBOL) (www.bolgermany.de), which co-ordinates an inventory of all species in the country to develop genetic markers (DNA barcodes) for rapid, automated species identification from environmental samples. The programme is financed by the Federal Ministry for Research and Education and supports 300 voluntary experts. Contributors help to collect and identify a wide range of taxa for barcoding, from spiders and insects, to fungi, diatoms and flowering plants. These samples are sent to participating NHMs where DNA samples are extracted and sequenced, and associated voucher specimens (any specimen that serves as a basis of study and is retained as a reference) stored. Sequence data are made available via free and easily accessible databases (BOLD, GBOL: Geiger et al. 2016) and the contribution of all partners is shown on the project website. Citizen scientists can access training on how to evaluate sequence data and receive a small expenses allowance for providing specimens (figure 29.1).

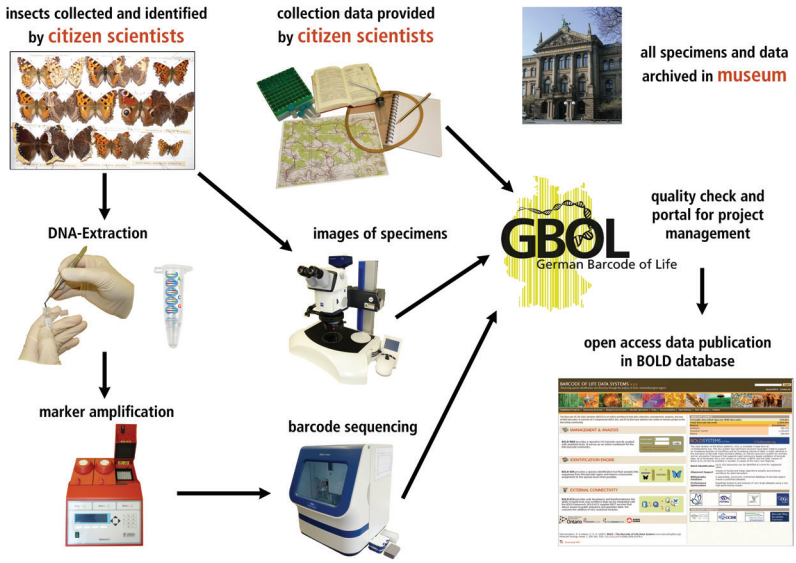

Fig. 29.1 Flow chart showing the structure of the German Barcode of Life

Museum-led BioBlitzes

BioBlitz events provide the opportunity for professional scientists, amateur naturalists and local communities to explore and learn together (see also Gold & Ochu in this volume on citizen science events). They raise awareness of biodiversity and the importance of biological recording, while generating a biodiversity 'snapshot' inventory for a given site (see Robinson et al. 2013).

MNHM has organised several 24-hour BioBlitzes (Sforzi 2017), each located within a Natura 2000 site – a European network of core breeding and resting sites for rare and threatened species and natural habitat types. The choice of sites facilitates promotion of the Natura 2000 network among local people while contributing to the gathering of knowledge for the implementation of EU Bird and Habitats Directives' reports. On average, 30 different wildlife surveys were carried out in each BioBlitz, with more than 1,200 participants contributing over the last five years. This level of participation is encouraging, especially considering the geographic position and low population density of the survey areas (Southern Tuscany, Italy). Final species lists ranged from 450–700 terrestrial, freshwater

Fig. 29.2 Snapshots of some activities carried out during the BioBlitzes organised by the Maremma Natural History Museum. (Source: Andrea Sforzi)

and in some cases marine species. Rare native and invasive alien species were also recorded to address specific conservation issues and reports synthesising the main outputs were distributed to all participants (Sforzi et al. 2013) (figure 29.2).

Many other NHMs have focused on BioBlitzes as a way of doing citizen science. For example, NHM London has led or convened events that have attracted between 500 and 8,000 members of the public and helped to develop understanding of UK biodiversity, as well as supporting site management practices (see Ballard et al. 2017). In Germany, BioBlitzes are typically organised in co-operation with the journal *GEO*. In 2014, the MfN Berlin, with citizen science partners ORION and naturgucker.de, organised a BioBlitz in the president's garden and presented the results during a large public event. As well as generating biodiversity data, the event aimed to raise awareness of urban biodiversity. This is a common theme across NHM citizen science activities, reflecting the urban location of museums and their visitors.

Digital technology–mediated citizen science

Digital technologies are increasingly enhancing both citizen scientists' experiences and research leaders' ability to access and process collected data. In the context of NHMs, digital participation is a highly scalable approach that can extend project reach and engagement nationally and internationally (Robinson et al. 2016). The extraction of data from specimen archives is a key area where this is being applied (see www.idigbio.org). Natural history museums house vast collections on the world's biodiversity and geodiversity, with biological material collected across more than three centuries. The majority of specimens are accompanied by a written or typed label detailing the species name, its collection location and date; a treasure trove of information with the potential to enhance scientific understanding of species range dynamics, population genomics and responses to environmental change (e.g., Johnson et al. 2011; Bi et al. 2013; Willis et al. 2017).

The digitisation of this specimen data – which is often handwritten – cannot yet be fully automated and specimens held across institutions cannot be easily accessed or searched. National history museums across Europe and the rest of the world are initiating mass digitisation programmes to image and catalogue their collections, and make the information freely available and searchable for researchers and the public. MNHN

Paris' project, Les Herbonauts, and NHM London's involvement in projects, including Notes from Nature and Herbaria@Home, demonstrate that involving the public in transcribing information from specimen labels and registers into digital databases can be highly successful, but not without its challenges. For example, nineteenth-century handwriting can be extremely difficult to interpret, particularly when it comes to unfamiliar place and species names.

Previous activity of this sort was undertaken on site by museum volunteers and required computers, desk space and supervisor time. Online crowdsourcing is a relatively new activity, enabled by widespread access to technologies and fast download speeds for accessing high-quality images. Undertaking crowdsourcing on a mass scale moves museums into a new sphere of interacting with online, geographically dispersed digital citizen scientists. NHM London is currently exploring how lessons learned from traditional citizen science activities can be applied to this online environment, how participant motivations and online engagements differ (or are similar to) those of outdoor citizen science projects, and how the benefits gained by volunteers working alongside curators on site may be transferred to the geographically distributed model of crowdsourcing. The Orchid Observers project is one route through which these questions are being investigated (figure 29.3).

The digital revolution is also influencing how field-based NHM citizen science projects are being delivered. Improved access to the internet and availability of mobile phones with built-in cameras and GPS receivers is rapidly expanding the digital element of many pre-existing or 'traditional' recording activities (see also Mazumdar et al. in this volume). For example, MNHN Paris' SpiPoll project asks participants to photograph every different kind of invertebrate visiting the flowers of a chosen plant for 20 minutes. The participant then selects one photo per 'morphospecies' and uploads it to the website. An online-identification tool based on a learning neural network then compares the image with a database that currently contains data on 630 species, and estimates the probability of a correct identification. Together with a photo of the plant and its immediate surroundings, this list of photographs makes a 'collection' which is then shared with other participants for validation. Over six years, 1,500 participants have contributed 27,000 collections and an incredible 270,000 pictures; a significant volume of scientific data that could not have been gathered by other means.

The OPAL Bugs Count app, developed by NHM London as part of the OPAL programme, enables participants to photograph the target species

Fig. 29.3 The Orchid Observers project at NHM London combines the online transcription of historical specimen data with contemporary biological recording. It investigates how the UK's flora is responding to climate change by building a 200-year record of flowering times for 29 species of UK orchid. Over 1,900 people have participated, extracting scientific data from 3,700 specimens and generating 1,700 new field observations. The project is a collaboration with Zooniverse and the University of Oxford. (Source: Orchid specimen – Natural Museum [NHM] London. Screenshots of Orchid Observers website – NHM/Zooniverse)

of invertebrate and immediately submit a georeferenced photograph to the survey team for verification. The latter step streamlines data upload and enables data quality to be managed. Significantly more photographs were submitted via the app than through the project website (Robinson 2015, pers. comm.), reflecting the ease of use and growing familiarity with app-based systems. MfN Berlin is currently developing an app platform called Anymals, which can be adapted to any taxonomic group or research question. Data from the app can be automatically made available via the Global Biodiversity Information Facility (GBIF), to the benefit of global research and conservation communities (see also Ballard, Phillips & Robinson in this volume for more on the GBIF).

Discussion

This chapter has described some of the principle ways through which NHMs are actively employing citizen science to meet their joint educational and scientific research goals. Alongside more traditional mechanisms of support for amateur-expert naturalists, the benefits of involving large numbers of members of the public (who may have had no prior subject experience) in gathering and curating species observations and extracting data from historical specimens is increasingly recognised (e.g., Ballard et al. 2017). In the context of NHMs, citizen science can be thought of as a disruptive approach that is actively shaping how museum-based biodiversity research and engagement are being delivered. This final section summarises some key conclusions relating to the application and future potential of citizen science, through the lens of European NHMs.

Factors that influence the role and success of citizen science within NHMs

National history museum missions generally span collections development and access, advancing scientific knowledge about the natural world, and inspiring and educating the wider public about the wonder, diversity and importance of nature. A key reason for ongoing investment in citizen science by major NHMs is because it can simultaneously deliver each of these core, mission-related priorities. This has been critical in securing the necessary resourcing from scientific and public-facing teams. NHMs are also particularly well-placed to deliver and facilitate citizen science, due to their long experience in science communication and collaboration with amateur-expert naturalists, and their combination of scientific, education and engagement expertise. Other relevant factors are institutional longevity, public profile, reach and trust, all of which aid project publicity and uptake (see also Richter et al. in this volume).

A number of published resources review and outline best practice steps delivering citizen science projects based on the success of individual projects (e.g., Roy et al. 2012; Tweddle et al. 2012; Pocock et al. 2014b, Robinson et al. in this volume). Collectively, these highlight that citizen science is most effective when a) there is clear benefit for both researchers and citizen scientists; b) the project aims are clearly stated from the outset; c) researchers have (or can benefit from colleagues who have) experience in public engagement and outreach; d) evaluation is built in

and used to improve the programme over time; e) citizen scientists are valued and adequately supported; f) the quality of the scientific data generated is measurable; and g) the project is appropriately resourced. In addition, Devictor, Whittaker and Beltrame (2010) advised that projects should manage their resources sustainably to ensure that data are adequately stored, analysed and published. The most successful NHM-led projects take all of the above elements into account. However, this has clear resource implications and is not always fully achievable. Working effectively across the institution can be a particular challenge, as museum departments often manage time and resources in different ways.

Finally, as respected and politically neutral institutions, museums are particularly well-placed to act as platforms and conveners for citizen science co-ordination, exhibitions, discussion and debate. Indeed, this type of activity directly helps museums to demonstrate their societal relevance and value (see Wyler & Haklay on the university context too). Citizen science requires institutional support, such as trained project personnel and an investment of researchers' time and resources (Novacek 2008; Richter et al. in this volume). NHMs are favourably placed to provide such support at the science-society interface. Germany is an excellent example of how this is being implemented as the Federal Ministry for Education and Science supports a consortium of research institutions, including the MfN Berlin, to hold workshops, develop guidelines and develop a strategy (Bonn et al. 2016) for citizen science within Germany. This has been achieved through a broad consultative process and investment in supporting networking between initiatives, for example, via the web page (www.buergerschaffenwissen.de) and events. In the UK, the Angela Marmont Centre for UK Biodiversity at NHM London is a free resource centre where amateur naturalists can develop their skills and acts as a hub for citizen science. A core strand of their citizen science programme is dedicated to supporting other citizen science practitioners.

Challenges

In keeping with other organisations, securing sufficient resources to establish and maintain projects is not always straightforward. Resources (e.g., staff time) for community management to deliver project evaluation is often most affected. In keeping with the field of citizen science as a whole (e.g., Pandya 2012), significant work remains to develop truly inclusive NHM-led projects (see for example Haklay; Smallman, both in

this volume). The broad visitor demographic of many NHMs indicates that they can play an integral part in tackling this critical challenge (Ballard et al. 2017) but if citizen science is to become a truly accessible field of practice, sustained work is required in this area and that of open data (e.g., Groom, Weatherdon & Geijzendorffer 2017).

Arguably the most pressing concern in the specific context of NHMs, however, is the decline in numbers of both amateur and professional taxonomists. Volunteer biodiversity recording has also declined and a new generation of enthusiasts needs to be recruited (Hopkins & Freckleton 2002). In Germany, Frobel and Schlumprecht (2016) document a 21 per cent reduction in the number of taxonomists over the past 20 years, with only 7.6 per cent of experts being younger than 30. This is especially problematic for nature conservation. It has been argued that specialist amateurs are declining, while more generalist volunteers and environmental enthusiasts are on the rise (Lawrence 2010). More recently, other authors have warned about the decline, death or 'impending extinction' of natural history as both an academic subject and amateur activity (Tewksbury et al. 2014). Should this be confirmed, it would be a source of great concern, not least as the need for biodiversity knowledge is increasing (Dayton 2003). An adequately trained group of amateur and professional taxonomists is central to knowledge of the world's biodiversity and how it is responding to pressing environmental changes (e.g., Davies et al. 2016). Increasingly, citizen science shows the supporting role that can be played by people of all ages, backgrounds and subject knowledge. However, continued support is needed for the development of individuals and communities with high levels of taxonomic knowledge and the motivation to observe and document changes within nature over long timescales. National history museums, universities, academic researchers and NGOs can cooperate to fill this gap, developing solutions especially designed for particular demographics such as youth audiences (see also Harlin et al.; Wyler & Haklay, both in this volume).

The future of NHM citizen science

The examples described above demonstrate how museums are continuing to support traditional citizen science activities such as biological recording, while embracing new approaches and technology developments that were unimaginable a few decades ago. Collections-based projects will remain a central area for innovation, as will the development of evermore engaging citizen science gallery-based displays and interventions.

More broadly, NHMs are ideally placed to continue to lead by example, delivering projects with strong outcomes for both science research and environmental education and showcasing the work of other practitioners.

This role is likely to continue, including through the sharing of knowledge and experiences between citizen science practitioners via practitioner-based associations. In recent years, NHMs have taken a central role in establishing the ECSA, a network of people and institutions (research institutes, universities, museums and civil society organisations) aimed at sharing best practice, building capacity for citizen science across Europe and advocating for it as a participatory research methodology with relevance to both researchers and decision-makers. European NHMs have been involved in the development of ECSA from the inception of the idea to its incorporation as an NGO and charity, now co-ordinated by its headquarters at MfN Berlin. All NHMs that contributed to this chapter are key organisations in the association. The European Citizen Science Association aims to establish closer links between museums, other research institutes, civil society organisations and citizen groups. Strategic associations like ECSA help to mainstream environmental citizen science as an approach for gathering data to improve environmental policy, as well as to monitor compliance with existing regulation, thus increasing opportunities for participatory environmental governance.