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"Contact Zone": i ruoli dei musei scientifici nella società contemporanea
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Citizen Science as a tool for enhancing the role of a museum

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ABSTRACT
Natural history museums held an ancient tradition of involving non-academics in data collection and research projects. Given their dual remits of research and education, they are ideally placed to link these two sectors and to play a relevant role in the field of Citizen Science (CS).
At a time when we are experiencing a severe impact on biodiversity, a change in approach to environmental monitoring and conservation is required, and museums have the opportunity to lead this process. The role of museums owns a full potential for the benefit of people and biodiversity, but also a mean to enhance their function into society. It is probably not a case that natural history museums are among the founders of the European Citizen Science Association (ECSA).
In Italy, as well as in other countries, specific programs involving public in the monitoring process can lead to a greater acceptance of the leading institutions, assuring a better chance for survival and flourishing. This paper has the aim to depict the range of citizen science activities carried out by the Maremma Natural History Museum during the last five years, ranging from a recording site to courses for aspirant Citizen Scientists, to 24h Bioblitzes. An experience at the "museum-society interface" that could be easily applied to other museums and socio-cultural contexts.

Key words:
Citizen Science, museums, biodiversity monitoring.

RIASSUNTO
La scienza partecipata (Citizen Science) come strumento di rilancio e valorizzazione del ruolo di un museo.

I musei di storia naturale vantano una antica tradizione nel coinvolgimento di persone non appartenenti al mondo accademico nella raccolta di dati e in progetti di ricerca. Data la loro duplice competenza negli ambiti della ricerca e dell'educazione, essi si trovano nella posizione ideale per unire questi due settori e svolgere un ruolo di rilievo nell'emergente settore della Citizen Science (CS).
Il periodo che stiamo vivendo è caratterizzato da un grave impatto sulla biodiversità, che implica un cambiamento di approccio verso il monitoraggio ambientale e la conservazione; i musei hanno l'opportunità di guidare questo processo. Essi possono svolgere un ruolo di rilievo a vantaggio delle persone e della biodiversità, ottenendo al contempo l'importante risultato di rinnovare e migliorare la loro funzione nella società. Probabilmente non è un caso che alcuni tra i più importanti musei di storia naturale europei siano tra i fondatori della Associazione Europea di Citizen Science (ECSA).
Programmi specifici che coinvolgano il pubblico in iniziative di monitoraggio ambientale possono portare ad una maggiore accettazione delle istituzioni museali, che da tempo mostrano i segni di una profonda crisi, assicurando migliori possibilità di sopravvivenza e prospettive di sviluppo. Questo articolo ha lo scopo di rappresentare la gamma di attività di citizen science realizzate dal Museo di Storia Naturale della Maremma nel corso degli ultimi cinque anni, che vanno da un sito di registrazione di osservazioni naturalistiche, a corsi per aspiranti Citizen Scientist, a Bioblitz della durata di 24h. Una esperienza di "interfaccia tra musei e società" che potrà essere facilmente replicata da altri musei e contesti socio-culturali.

Parole chiave:
Citizen Science, musei, monitoraggio della biodiversità.

INTRODUCTION

In a 2014 a Nature editorial note pointed out that Italian historic scientific collections in Universities and museums were at risk.
Economic crisis, the retirement - without replacement - of experienced taxonomists and a general decline of interest about the collections made the situation crashed, with the result that at least one-third of all national biological specimens have been lost (Nature Editorial, 2014). More recently, Andreone (2015) on behalf of 28 colleagues, underlined the need of a national coordination of the smaller natural history museums as a mean to prevent the scientific collections from deterioration.

The same authors suggested participation in survey work and field research for the conservation and promulgation of biodiversity as a solution to strengthen the scientific influence of the museum's network. This paper aims to develop this concept further.

The current and potential role of Citizen Science (CS; namely the involvement and the active participation of people of various ages, education and backgrounds, in scientific research) is increasingly recognized regionally and internationally. For example, the European Commission's White Paper on Citizen Science (Serrano Sanz et al., 2015) recognizes the value of the participatory science approach and its relevance to EU strategy. This process of "democratization of science" has affected a growing number of disciplines, becoming a prominent phenomenon. Citizen Science doesn't just communicate science to participants, but actively engages them in gathering data for monitoring and conservation purposes.

Natural history museums held an ancient tradition of involving non-academics in data collection and research projects. Moreover, given their dual remits of research and education, they are ideally placed to link these two sectors and to play a relevant role in the field of CS. Citizen Science offers a potentially cost-effective way to obtain reliable data sets through public engagement. CS has the potentiality to re-connect museums to people and, as a result, to the local socio-political context. Re-gaining a role, acting as a facilitator of this process, might act as a major tool to rehabilitate museums in the social context, giving them an additional chance that the recovery of the collections alone would not give.

OUR EXPERIENCE

The Maremma Natural History Museum (MNHM) is based in Grosseto (Tuscany, Central Italy). It is a small institution involved in research, education and conservation of the local environment, established in 1971 by the Grosseto municipality to host the collections gathered by the Maremma Natural History and Speleological Society. In 2009 a new building, with totally renewed exhibitions, was opened to the public. In the framework of new management course, since 2011 the museum promotes citizen science activities inspired by some leading international projects, such as OPAL (Davies et al., 2013). As a result of these international collaborations, the Maremma Natural History Museum played a central role in the setting up of the European Citizen Science Association (ECSA, registered in Berlin as a no profit organization in 2014), with a member in its Board of Directors. Citizen science has become the mainstream of MNHM to deliver its objectives. The museum provides technical support for citizen science through a website, networking, data recording, training courses and conferences. Survey topics are defined by the Museum, and leading scientists from the Museum, collaborating Universities and research centers help developing the research questions. Field guides for each activity are provided. A verification process is carried out to ensure the quality and reliability of data collected.

COLLABORATIVE INVENTORIES FOR MAPPING OF BIODIVERSITY

One of the first CS activities of MNHM was the setting up of a recording website based on the open source software Indicia. It is a platform to collect fauna and flora sightings, as well as developing some national-scale inventories. A leading example of collaborative inventory for mapping biodiversity is the crested porcupine national survey. Crested porcupine (*Hystrix cristata*) is a large rodent of almost certain anthropochorous origin, whose European range is confined to the Italian peninsula. Its distribution is under continuous development, since the species' Northern (and possibly a sector of the Southern) range is still expanding.

The national survey involved many people in collecting sightings that could confirm the presence of this large rodent in its "historical range" and less known neighborhood areas, as well as in the newly colonized territories. People involved filled the on-line form provided, or sent pictures and sightings' details by e-mail to the referents of the project. Some others just put the information in national sectorial mailing lists and were lately contacted to get the permission to include their data into the national database. Given the different ways chosen to contribute to the project, the number of contributors is difficult to define in detail, but could be estimated in about one hundred people, mainly wildlife enthusiasts, first time citizen scientists and wildlife professionals. In most of the cases sightings were accompanied by pictures taken to road-killed animals, quills, feces, or tracks. Given its peculiar body structure, crested porcupine is quite easily recognizable and almost impossible to be misidentified. These aspects made it an almost ideal target species and speeded up the verification process. Data were then pooled with historical information coming from scientific as well as "grey" literature. The main findings of the project are summarized in a scientific paper dealing with the species' range extension (Mori et al., 2013). An interactive, "live" map of the species' national distribution is available at: http://www.naturaesocialmapping.it/node/6

24H BIOBLITZES

A bioblitz is an event aiming to discover as many types of wildlife as possible, within a set location and over a defined period of time, usually 24 hours (Robinson et al., 2013). Bioblitzes provide the chance for scientists and citizens to explore and learn together, aiming to raise awareness of biodiversity and the importance of biological recording, whilst generating biodiversity information (Robinson et al., 2013).

Our Bioblitzes were the first organized in the Tuscany Region and among the first in Italy (fig. 1). Organization was planned and arranged by the Maremma Natural History Museum, by recruiting a Bioteam of 30 experts from different Universities and research institutions.

MNHM organized four bioblitzes, two at the "Oasi di San Felice" (a coastal private reserve included in a SCI 2 SPZ, characterized by a pinewood dominated by stone pine *Pinus pinea* and maritime pine *Pinus pinaster* and mature sandy dunes) in 2013 and 2014. In 2015 the location was the SIR Trasubbie (a wide area surrounding a river with torrential regime, included in a Regional Interest Site) and in 2016 the Accesa Lake (a large natural area surrounding a natural lake, included in a SCI). People could either register to participate in the Bioblitz through our recording website or sign directly when arriving at the base camp. More than 1000 citizens took actively part to the events. About 30 different sessions of data collection were carried out in each bioblitz. Citizens took part both to data collection/recording in the field and identification of taxa in a camp laboratory. This effort allowed to detect 377 taxa in 2013 (319 at species level, 58 at genus or higher levels) and 428 taxa in 2014, when we could involve a number of researchers expert of a greater number of taxonomic groups, especially invertebrates (376 at species level, 52 at genus or higher levels). Pooling the two years, at least 583 different species were recorded (50 mushrooms, 234 plants, mosses and lichens, 218 invertebrates, 12 fishes, 3 amphibians, 6 reptiles, 51 birds and 9 mammals; for a complete list see Annex A of the report) in the same area.

A first report has been distributed to participants and published online (Sforzi et al. 2013; available at: https://docs.google.com/uc?export=download&id=0B7V6NZEjbcnYS1IzOGJJMUFqYTQ).

Despite most species were relatively common, 32 (8.5% of the total) were protected by regional, national or international laws, conventions or directives. Namely 11 plants, 3 Insects, 2 fishes, 1 reptile, 8 birds and 5 mammals. Some alien species were also recorded (complete list on Appendix B of the report). Among the most interesting results of the San Felice bioblitzes, the record of the alien jellyfish *Mnemiopsis leidyi* has to be mentioned. It was never reported in this site before. Another relevant result was the presence of 4-7 breeding pairs of the European Roller *Coracias garrulus*, a bird in need of protection ("vulnerable", Italian Red List) which is also the symbol of the Reserve. Data from the bioblitzes carried out in 2015 and 2016 are still under elaboration; preliminary estimates account for about 560 and over 600 species recorded, respectively.

Fig. 1. People taking part to a MNHM bioblitz.

Fig. 2. People taking part to a MNHM course for Citizen Scientists.

COURSES FOR ASPIRING CITIZEN SCIENTISTS

In the framework of the CS activities carried out by the Maremma Natural History Museum, a set of 25 courses for people interested in learning how to identify specific taxa and monitoring them in the field through Citizen Science have been planned. Seven of them have been realized until now (July 2016). The plan is inspired by the 2020 deadline to halt the loss of biodiversity; each year, starting from 2014, refers to a different habitat, within a gradient from the coastal habitats to the uppermost part of the Grosseto Province (beech forests; Amiata Mountain). Every year 3 to 4 courses are organized, each one designed together with a leading scientist in the selected area of interest (several taxa of animals and plants). People attending the courses have to pass a final test (fig. 2). About eighty people successfully attended the courses and could start using the specific technical leaflet provided (fig. 3).

FINAL REMARKS

Citizen science activities encompass most of the functions of a museum: education, environmental monitoring, dissemination of scientific results, etc. Natural history museums have the skills to afford the challenge of tackling many emergent environmental questions in a growingly participated way, acting as a catalyst of the process. This is already happening in other European Countries.

Recent developments in technology, communication methods and approaches to public engagement are providing exciting opportunities for scientists to work in partnership with the public (Bonney et al., 2009; Bonney et al., 2014). This approach operates as a powerful tool to promote sustainability through the citizens that took part to the collection of data and to a larger portion of the population. The degree of applicability and success of a project of Citizen Science lies in the ability of researchers involved to imagine a new way of doing science, planning differently the various stages of research, adopting new solutions to preserve the same levels of repeatability, reliability and robustness of the "traditional" scientific process. Nevertheless, Citizen Science (albeit with a large range of applications) is actually a research method, and as such not necessarily applicable in all contexts. Insight reports providing guidance on the level of applicability of the CS in different contexts has been produced for UK (Tweedle et al., 2012; Roy et al., 2012; Pocock et al., 2014).

Gaining a greater understanding of the state of the natural environment is a core function of any Museum. Take that knowledge deep into the community, encourage and support more people to learn about and record wildlife is a valuable additional activities that Citizen Science can remarkably help to pursue. CS has the potentiality to re-connect museums to people and, as a result, to the local socio-political context. Re-gaining a role, acting as a facilitator of this process, has the potentiality to rehabilitate museums' function in the society.

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Fig. 3. Some of the guides (technical leaflets) produced by MNHM to help Citizen Scientists to identify some target species in the field.

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