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What is at stake for scientists when communicating ecology? Insight from the informal communication initiative "Cammini LTER"

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Abstract.
What is at stake for scientists when communicating ecology? This is the basic question tackled in this paper, that we explored through reflections about an initiative of informal communication of ecological research called "Cammini LTER": itineraries connecting a number of sites belonging to the Italian Long-Term Ecological Research network (LTER-Italy). LTER-Italy ecologists walked and cycled together with citizens creating a physical and visible movement of researchers 'towards' and 'with' citizens, aiming at providing the public with the opportunity to get familiar with Italian ecosystems, from the sea to alpine tundra. We address here the debates and the critical considerations among researchers themselves, stimulated by the overall experience, with focus on some relevant issues pertaining science communication, and even research production, evidencing the need for a cultural shift, which go far beyond the national context and the LTER – Italy network. Using a participant observations approach, through researchers' words used to describe - formally and informally - the experience, we report and comment here the main narratives emerged, showing different attitudes of LTER researchers in Cammini towards the society and the role of ecology in it. Relationship and knowledge exchange appear crucial for communicating ecology, which can thus become an opportunity for building new qualities of knowledge and for creating a shared civic culture, able to make all players feel mutual responsible and contribute to the solution of particular socio-ecological challenges.

Key words. Long-term ecological research, LTER-Italy, Cammini LTER, Informal science communication, Science and society.

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1. Introduction

Human beings are changing, everywhere in the Planet and at an exceptional rate, their relationships with the natural environment (Millennium Ecosystem Assessment, 2005). This has placed importance on the study of society-nature interactions, and the present environmental problems are considered not only ecological but also socio-ecological and cultural. Indeed, the way human societies interact with their environment has consequences not only on ecosystems, but also on social systems themselves and on human wellbeing. Social justice, economy, national security, and human health are actually considered as environmental issues, since they basically depend, to different extents, from structure and functioning of ecosystems across the globe (Lubchenko, 1998).

According to the socio-ecological approach, ecological research becomes also a cultural process, not only a scientific one, entangled within historical social values (Haberl et al., 2006). For ecosystems and biodiversity to become more culturally valued by society, scientists and citizens need to be reciprocally engaged and reconnected, starting from their territories, developing more intimate relationships with and, ultimately, taking care of them (Folke et al., 2011, Jamieson, 2011).

The relationship (*sensu lato*) is indeed the heart of many concepts in ecology, including those concerning indicators of sustainability, which have moved from an approach focused on "problems to be solved" to one addressing the "origin of the observed relationships". Concepts such as carrying capacity, ecological footprint, and ecosystem services are all metaphors used to describe relationships between human society and nature, and the dangers of excessive exploitation. However, they remain mainly abstractions and conceptualizations, and new methodologies, especially in the communication and education frameworks, need becoming more embedded in the culture and in the daily experiences (Gray & Colucci Gray, 2018).

With respect to the latter, the interface between ecological science and society requires to be reframed, for instance, thoroughly reconsidering the way scientists communicate and engage with society (Groffman et al., 2010). This could be implemented for instance by merging the prevalent cognitive and rational approach of ecology as a science with a more emotional one, which is the core of the "affective ecology", a branch of the ecological thought dealing with emotional relationships between human beings and the rest of the living world (Barbiero, 2011; Barbiero, 2014).

Many ecologists are involved in communicating science to the public and in addressing societal concerns about environmental issues. Evidence to the latter respect comes from a variety of sources and is motivated by different reasons, such as (i) improving public understanding of science and informing and educating the public, (ii)influencing policy, (iii) proposing solutions to environmental problems (Pace et al., 2010).

Scientists' ideas of public communication are object of investigation since two decades at least, showing different attitudes towards the public, ranging from deficit model to more inclusive forms of interaction. The practices of communication (i.e.: the ideas of public, of science and of communication) are considered relevant for understanding the way scientists frame and shape the communication process. Reflecting on them is therefore necessary, "being scientific understanding of publics just as relevant as public understanding of science" (Lévy Leblond, 1992). While it is generally recognized that communication activities can be important for the public, less explored is the importance and the impact that such activities may have on scientists themselves.

In this paper, we wish to reflect on how researchers perceived and represented the relationship with society within the context of the informal science communication initiative called "Cammini LTER": a series of trails, performed by walk or by bike, promoted starting from 2015 by the Italian Long-Term Ecological Research network (LTER-Italy, www.lteritalia.it),

with the aim of making people aware of what ecology and LTER activities are. In Italy, school-education in the field of ecological science is quite inadequate and opportunities for discussion between society and experts of environmental problems, also at the local level, are rare. Science communication in Italy primarily targets people with high-level education and, when addressing the general public, ecology is only a secondary issue. The concept of ecology is therefore quite often unknown or misinterpreted: the word ecology is mainly linked to sewage disposal or to "green" or organic commercial products, ignoring the existence of ecology as a science that study nature, its functioning and the way it sustains our lives.
During Cammini LTER, scientists, as the ancient "story-tellers" on the road, shared experimental works and ecological studies with people met along the itineraries and at the LTER sites, which were landmarks of each trail. Cammini were imagined as a sort of Via Francigena (the ancient medieval pilgrim route running from Canterbury to Rome) of ecological research and they were integrated in a long-lasting tradition, where walking is considered the most intimate way to engage with landscape, offering privileged insights and knowledge into both places and self (Solnit, 2000).

The reflections we present herein focus only on LTER scientists, on the principal motivations and drivers for their engagement with the public and on how they have been discussed and might have been reframed along the trails. Through researchers' words, which were used to describe - formally and informally - the experience, we report and comment the main narratives emerged, showing different attitudes of LTER researchers in Cammini towards the society and the role of ecology in it. Reflecting on how scientists perceive the relationship between science and society can be a fundamental starting point for developing a more open, empathic, responsible and collaborative ecological communication and relationship with society, which may lead to a deeper awareness of the role of each actor in the management and care of the territory.

1.1. LTER-Italy and the initiative

Long-Term Ecological Research (LTER) aims at better understanding, analysing, and monitoring changes in ecosystem patterns and processes over extended periods of time, typically decades. LTER is organised in networks of sites and platforms - at the national, continental (i.e., European, LTER-Europe: http://www.lter-europe.net/) and global level (ILTER: www.ilter.network) - where comparable approaches and meaningful interpretations of on going ecological processes are developed (Mirtl et al., 2018; Mollenhauer et al., 2018). The distinctive trait of the LTER networks is the integration among research sites and platforms, where long-term ecological observations are maintained, also in the perspective of creating a legacy of well-designed and documented knowledge for future generations. Since more than a decade (Singh, Haberl, Chertow, Mirtl & Schmid, 2013; Mirtl et al., 2018, Dick et al., 2018), the integration of social sciences in LTER has become one of the main priorities. Socio-ecological research is conducted in national LTER networks worldwide, aiming at collecting and synthesizing both environmental and socio-economic data and to involve a broader stakeholder-community so as to define research priorities (Haberl et al., 2006; Mauz, Peltola, Granjou, van Bommel & Buijs, 2012; Dick et al., 2018). The LTER networks therefore represent an appropriate and suitable context where new and different forms of communication and public participation and engagement could be experimented.
LTER-Italy (www.lteritalia.it) belongs to LTER-Europe and ILTER since 2006. It involves many national scientific institutions (National Research Council, universities, other national research institutions), scientific societies and public agencies. It is made of 79 research sites, from the terrestrial, freshwater and marine ecodomains,

representative of the main Italian ecosystem typologies (Figure 1).

LTER-Italy researchers planned and realized, starting from summer 2015, an informal science communication initiative called Cammini LTER (i.e. "Trails LTER"): researches walked and cycled along itineraries, which connected two or more LTER sites, aiming at making the public more familiar with the components, conditions and changes of Italian ecosystems, from the sea to alpine tundra, i.e., wherever LTER is active. During each leg of the trails, which lasted from four to ten days, informal events and communication activities were carried out, in tight connection with the territories that were largely heterogeneous both in size (from big towns to small villages) and audience (from school children to elderly people, from lay people to territorial managers, such as foresters, ecological and alpine guards, local environmental associations).

Figure 1. Map of Italy where the 79 LTER-Italy research sites are evidenced. The colours of the dots correspond to the main ecosystem typologies: Blue=marine, light blue= freshwater, light green=transitional water, green=terrestrial. The red spots indicate the sites reached by Cammini LTER in 2015. The main features of the sites can be found on DEIMS, the LTER-Europe repository for research sites and datasets (https://deims.org/)

1.2 The trails

This paper focuses on the three Cammini LTER that took place, two by walk and one by bike, during summer 2015. Their main features and the itineraries are reported in Table 1 and Figure 2.

"Mesothalassia" (literally translated from the Ancient Greek "a land between the seas", http://www.lteritalia.it/cammini/mesothalassia ; D'Alelio, 2016), launched the initiative. It was a bike-tour, which crossed longitudinally the whole Italian Peninsula, from the Adriatic to the Tyrrhenian coasts, and connected two LTER sites (Figure 3): the Coastal dunes (https://data.lter-europe.net/deims/site/lter_eu_it_020) and the Gulf of Naples (https://data.lter-europe.net/deims/site/lter_eu_it_013), on the Adriatic and Tyrrhenian coasts, respectively. The tour followed the courses of two rivers (Ofanto and Sele) and touched different inland-water environments, in addition to the marine ones: river mouths, brackish and freshwater lakes, lagoons, and springs. The main theme of Mesothalassia was actually water as a resource, in terms of food and energy production, biodiversity maintenance, and ecosystem functioning. The team included a total of 10 bikers, with different background (science, education, communication). About 200 bikers in total, distributed along the different legs, joined the team. More than 500 people attended Mesothalassia events, which included different formats. The events took place both at research centres and public spaces: the cooperation with local institutions (e.g. WWF Oasis, the Gargano National Park, several local authorities and citizen associations) was crucial for their organization.

Table 1. Main features of the trails Cammini LTER (see also Figure 2)

Trail name	Trail Type	Trail Period and duration (days)	Trail Length (km)	LTER sites included in the trail	Number of legs	Main themes	Organizing Institutions
Mesothalassia An ecological bike tour from the Adriatic to the Tyrrhenian Sea	Bicycle trail	28/6/15-7/7/15 (11)	600	Italian Coastal Dunes; Gulf of Naples	10	Aquatic ecology and plankton	Stazione Zoologica Anton Dohrn, University of Molise
The adventure of biodiversity On the Central Apennines, from Monte Velino to the Gran Sasso	Walking trail	29/7/15-01/08/15 (4)	70 (36 by walking)	Apennines - High elevation Ecosystems	5	Biodiversity, geology and landscape ecology	National Forest Service (now Carabinieri Biodiversità)
Pink…Blue…Green…! Eco-relay trail through LTER sites from Monte Rosa to Lake Maggiore	Walking trail	23/8/15-28/8/15 (6)	164 (62 by walking)	Western Alps; Mountain Lakes; Southern Alpine Lakes	8	Aquatic ecology, socio-ecological aspects, geology and landscape	IREA-CNR, ISE-CNR, University of Torino DISAFA

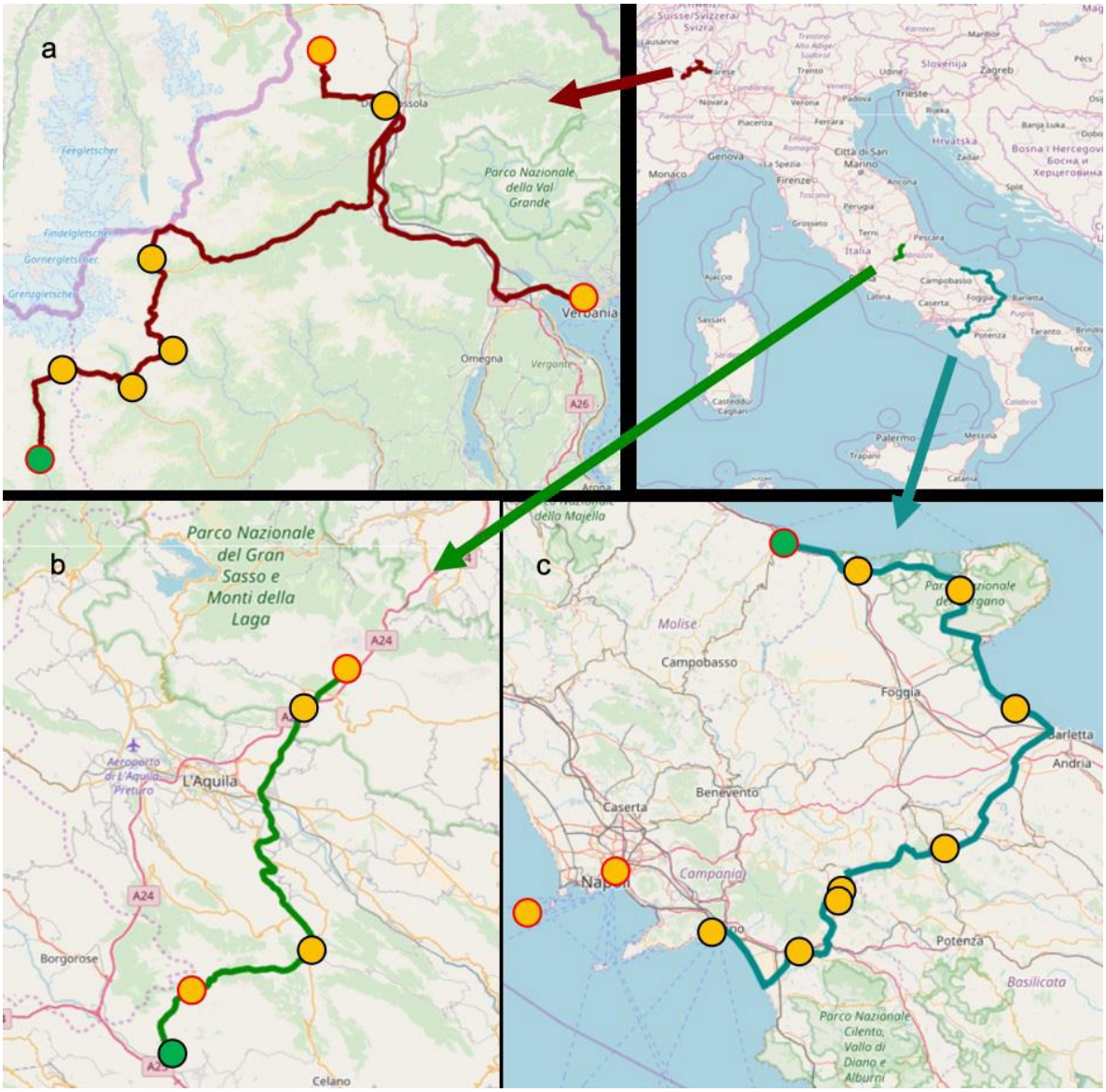

Figure 2. Map of Italy with the localization of the three Cammini LTER. a. "Pink…Blue…Green!"; b. "The adventure of biodiversity"; c. "Mesothalassia". The yellow dots indicate the stage of each leg, the green ones the starting points, the red outer circles the LTER sites. Created on Inkatlas. © OpenStreetMap contributors (openstreetmap.org).

"The adventure of biodiversity" (http://www.lteritalia.it/it/cammini/gransasso) was carried out within the LTER site "Apennines – High elevation Ecosystems (hiips://data.lter - europe.net/deims/site/lter_eu_it_001), in the Abruzzo Region, connecting, in four days, Mount Velino with Gran Sasso d'Italia, the tallest mountain in the Apennines (Figure 3). The trail crossed the typical landscape of the internal mountains in the Apennines (from mixed and beech forests to high altitude grassland) and two Natural Parks (Sirente-Velino and Gran Sasso e Monti della Laga). Researchers involved citizens in vegetation surveys, geological observations

and bird watching. A final "BioBlitz" took place at Gran Sasso: in practice, scientists, non-professional naturalists and volunteers executed a 24-hours field intensive study, working together to identify vegetal and animal organisms, thus contributing to an inventory of the biodiversity in the area.
The last walking tour, "Pink…Blue… Green…!" (http://www.lteritalia.it/cammini/rosa; Criscuolo, Carrara, Oggioni, Pugnetti & Antoninetti, , 2018), consisted of six legs, from the Alps to the subalpine great-lake area, and connected three LTER sites (Figure 3): High elevation sites in the Northwestern Alps (https://data.lter-europe.net/deims/site/lter_eu_it_019, Mount Rosa, Angelo Mosso Scientific Institute), Mountain Lakes (hiips://data.lter - europe.net/deims/site/lter_eu_it_009, Lakes Paione) and Southern Alpine Lakes (https://data.lter-europe.net/deims/site/lter_eu_it_008, Lake Maggiore). Both naturalistic and cultural diversities along the route were remarkable and the socio-ecological aspects were tangible: populations living in lake areas or in the ancient alpine villages, witness ages of challenging alliance between man and nature. Researchers joining the trail were mainly terrestrial ecologists with expertise in high altitude areas, limnologists, geologists, and Volunteer Geographic Information (VGI) specialists. During the trail, Citizen Science, in its contributory version (Socientize Consortium, 2014), and VGI activities were launched, through the use of two VGI apps to collect either biological or abiotic observations (http://www.lteritalia.it/content/citizenscience; Criscuolo, Carrara, Oggioni, Pugnetti & Antoninetti, 2018). At the three LTER sites people were invited to join the LTER sampling-activities focusing on soil and vegetation, lake waters, and even laboratory analyses of aquatic organisms (i.e., plankton and benthos). Nearly 200 hundred people joined the evening communication events, organized at the end of each leg, and dealt with topics of high relevance for the territory, in a fruitful dialogue with local authorities and citizens associations.

2. Materials and methods

In order to reflect on the different ideas of LTER scientists about the relationship between ecology and society, we explored the materials produced in each trail, i.e.:

(i) Communication material used to officially present the initiative (brochures of the trails and print releases);
(ii) Communication materials produced for social media (blogs and daily reports written by scientists during the trails, Facebook reports, tweets);
(iii) Video and audio interviews with some scientists in the course of Cammini. A total of 20 interview was carried out;
(iv) Video and audio records of spontaneous and free conversations among researchers

All the conversations were carried out in Italian and then translated into English to be reported in this paper.
We used a participant observation approach in the process of data construction (Strauss, 1987). Authors took part to the initiative and partly organized it acting both as participants and observers, according to the participatory action research (PAR), an approach to research in communities that emphasizes participation and actions, aimed at understanding the world by trying to change it, collaboratively (Chevalier & Buckles, 2013).

Figure 3. Pictures of the LTER sites that were reached by Cammini LTER. From left to right and from top to bottom: Coastal Dunes and Gulf of Naples (Mesothalassia), Mount Velino and Mount Gran Sasso (The adventure of biodiversity), Monte Rosa - scientific institute Angelo Mosso, Lake Paione, and Lake Maggiore (Pink…Blue…Green…!).

By comparing initial motivations declared in the official description of the initiative (such as statements from press releases) with following narratives emerged during Cammini, we explored if and how the initial main drivers for engagement with the public might have been reframed along the trails. In this comparison, we were particularly inspired by: (i) works supporting "reflexive conversations" among scientists who communicate science and scholars who study science-communication practices and (ii) models aimed at contributing to a more effective public engagement for sustainability (Salmon & Priestley, 2017). We were also inspired by studies exploring the ways in which communication with the public is talked about by scientists (Davies, 2008) and the role to this latter respect of non-traditional forms of interactions with the public, such as emotions, art, use of sites and places, etc. (Davies & Horst, 2016). We finally refer to previous inquiries on scientists' practices and perceptions of science communication carried out by some authors of the paper, arguing that when scientists communicate they do not confine their action merely to facts but also interests, views and beliefs of what science is and these issues should be integral part of the message (L'Astorina, 2011; L'Astorina, Cerbara, Valente & Avveduto, 2013).

The leading idea of these above-mentioned works is to consider communication as a relationship among actors, the result of a co-construction, where all participants bring their imaginaries (of science and of society) and negotiate the sense of their relationship. In our analysis, the focus is mainly on the meaning that such conversations, which explore researchers' motivations in engaging with the public in informal and itinerant activities, might have for the scientists themselves: "What is at stake for scientists when communicating ecology?" was our driving question.

In order to identify key themes and concepts in scientists' narratives, we used discourse analytic approaches affirming that "language is not simply a neutral medium for generating subject knowledge, but a form of social practice that acts to constitute as much as to reflect social realities" (Silverman, 2000; Flick, 2002).

The outcomes are quite diverse and complex, both for the heterogeneity of the materials themselves and for the different range of views, talks and ideas of the researchers. Despite this complexity, three main issues were identified during conversations, which will be presented and discussed in the following sections, supported by quotes from the researchers' words.

3. Results and discussion

The need to engage a wider audience in the existence, aims and activities of LTER-Italy was the initial driver of Cammini LTER: this was considered a means of increasing the socio-ecological impact of LTER studies and their interactions with the public. Researchers were also motivated by the aspiration to find more involving modalities to share their own experience and activity on the territory, going beyond the separation between scientists and the public. Doing something as simple, accessible, and sustainable, such as walking or cycling together, would create a physical and visible movement of scientists outside their laboratories towards and within society, relying on slow mobility, which promotes intimate relationships between people and nature.

During the three 2015 trails analysed herein, a big number of communication events were carried out and the chances for dialogue between researchers and lay people joining the trails were very frequent. The informal context in which researchers acted, the unusual guise in which they met people, the intimacy that the trails created, day by day, among researchers and with people, deeply affected the way scientists perceived their relations with the public and the communication priorities. Actually, the whole experience, the events, and the encounters produced quite unexpected

effects on the scientists: they engaged in discussions and critical considerations about relevant aspects and needs of science communication, framing them in the more general context of research- production. From the materials analysed, which illustrated - like a map - the reflections taking place among scientists, we could highlight mainly a sense of separation between (i) science and society, (ii) scientific and traditional knowledge, (iii) cognitive and emotional approaches. The empirical perception of these separations was evident, as well as the - apparent or hidden - conflicts that they generate and the need to overcome them. Therefore, we organized the following subsections along these three main subjects: (i) the relationship and the hierarchies in science and society, (ii) the need and the challenge of an iterative, two-way communication process, (iii) the potential to integrate scientific norms with emotional drivers.

3.1 Reframing the relationships and the hierarchies between ecology and society

The "movement of scientists towards citizens in the society" was one of the most recursive slogans used for promoting the Cammini LTER initiative. This metaphor evocates the image of a distance between science and society, with scientists living "up" in their "ivory tower" and citizens and the public in the "world out (and down) there": the former being a dynamic context where knowledge for society is produced and the latter a static one only making use of the knowledge produced by science. Here is how a scientist describes the Cammini experience in a personal daily blog:

"During the Cammini, we scientists left our labs, descended from our "ivory tower" and met people on the streets, park and greenways, attracting them as long-distance travellers used to get company and hospitality."

The representation of the ivory tower, as a metaphor often used to describe the distance between the scientific world and the society, is specious and not realistic. It is widely recognized that science works together or intertwined with other societal, cultural and historical factors, in a co-evolutive, complex, dynamic relationship (Latour, 1991; Nowotny, Scott & Gibbons, 2001; Sonnert & Holton, 2002). Yet, this metaphor effectively represents a common tendency of the scientific world to claim an autonomous status for science, disjointed from other domains of human activities, where facts are separated from values and those who produce knowledge from those who use it (Guimarães Pereira Â. & Funtowicz, 2015). This is partly due to the fact that science has become a complex and complicated world, evoking the idea of a new Middle Age in which researchers become "logical aliens" to one another, "serial hyper-specializers", with different languages and standards (Millgram, 2015).

Hyper-specialized language can therefore constitute another example of an ivory tower. During Cammini, ecologists recognized that the "science jargon" is one of the main obstacles to overcome for attaining a direct relationship with the public. A lot of attention was then dedicated to discussion on the best format to communicate, whether to use or not presentations, such as PowerPoint formats, or to engage in conversations with people giving more time for reciprocal discussion. Actually, during the organization of Cammini, scientists devoted much effort to produce communication materials simpler and clearer than usual and, at the same time, suitable for effectively transmitting information about basic ecological concepts and, in particular, about LTERs. However, the different kind of public met and the unusual contexts where communication took place made evident, since the very first days of each trail, the need for a more accessible language, but also that simplification was not enough and that the usual mind-set of researchers needed to be, in a sense, dismantled, in order to really enter in dialogue with people (Figure 4):

"We quickly realized that frontal lectures were not suitable for communicating science to a very general public, including people of varying ages and education levels. We abandoned PowerPoint presentations and, instead, we used simple tricks to stimulate the curiosity of the public. Such communication happens more easily while leaving our labs and institutions and meeting people in completely informal contexts."
(from an interview)

"Comprehending how to (and how not to) get people engaged in science is not an easy task to us, since we must learn from those who know how to do this job. Skills are important in order to better deal with publics, to use the right channels, methods, languages, but maybe we failed in all these aspects."
(transcribed from a free conversation)

Figure 4. During the trails the meetings with people frequently occurred outdoor, with informal exchanges of opinions and ideas. This picture was shot at the shore of Lake Paione (trail Pink…Blue…Green…!), where people were engaged in LTER sampling activities (Photo by Antonio Bergamino).

For some researchers, communication is not only a matter of style or of "getting the right message across", but of confronting with other worldviews and belief systems, overcoming "tacit hierarchies" between different kinds of knowledge (scientific, lay, expert, local) (Wynne, 2001; Felt, 2016). Adapting the scientific communication methods to other people's attitudes, shifting from the traditional one-way knowledge transfer, towards more collaborative approaches, which include multiple forms of expertise, is a quite challenging task. Walking and cycling side by side with people living in the territories, activated a spontaneous process of crossing cultural barriers, exchanging between different viewpoints, and this experience enriched the researchers' mind sets:

"What happens when citizens and researchers are riding side by side in the same environmental context? Citizens feel curiosity for a group considered elective, distant, and unapproachable. The local cyclists who joined us in Cammini know the territory very well as they ride it very often. However, the fact that they can share the same ride with us researchers, who study those territories from a scientific point of view, activates a mutual learning process, makes the route lighter and richer." (from an interview)

While reconciliation with society may be pursued by avoiding jargon, and communicating ecology can become "telling and sharing stories about the nature", a sort of fracture within the scientific community arises as scientists are being asked to produce excellence research, "to publish or perish": in consequence of this latter condition, those who decide to invest in public engagement are not always perceived as quality researchers. Although communication and public engagement are recognized as one of the three main commitments for science (the so called "third mission"), researchers do not yet feel fully supported by academy in their public-engagement initiatives. During Cammini, this sense of separation within the scientific community itself clearly emerged and was widely debated:

"I know what most of our colleagues think about this initiative: that while they are writing papers, increasing the quality of the research, we are only losing our time. That is to say, what we do is not to be taken seriously into consideration. But they fail in thinking so, as what we do now can have an impact on research itself, everything that opens up to the world is as important as research itself." (transcribed from a free conversation)

Differing to the "publish or perish" view, some scientists in Cammini felt that their career could not be complete and meaningful without including an active and personal involvement with the public:

"During this experience we perceived our research activities from another perspective, which makes more sense to most of us. Without the vital exchange with civil society, the products of our research remain fruitless". (from an interview)

3.2 Reframing the what and why of science communication

The main declared goal of Cammini LTER was to experiment new modalities to inform the public about ecological research carried out within LTER network, in order to increase the awareness towards relevant ecological themes in Italy. The decision to communicate using informal settings and more interactive forms, was partially motivated by the fact that some scientists promoting the initiative had got already familiar with some findings in the field of science communication, which indicate many forms of communication as ineffective and that values and experience strongly influence how public understands science (Weber & Ward, 2001; Einsiedel, 2008; Niesbet, 2009). One of the main recursive ideas in Cammini was that, in order to be more effective with the public, informal contexts and modalities were necessary; however, what science communication should be and which could be the main motivations and expectations, these were a matter of debate among the group. For some scientists, it was all about "getting the right message across", for others it was a question of "sharing emotions", for others it was about "mutual understanding of reciprocal experiences, knowledge and behaviours". What should then be communicated? It was clear to some researchers in Cammini that not only scientific content is needed but also sharing identity and the belonging community, to increase the sense of a mutual shared responsibility. The meeting with local associations, engaged in the environmental care of the territories, was particularly relevant to this regard:

"During Cammini we had the chance to meet local associations involved in the governance of the territory: we told them our views and listened to them. Through these encounters, we could recognize the knowledge already present on the territory: a type of knowledge consisting in being present in the territory, guarding it, living in it and developing respect to it." (from an interview)

"The fragility of the territory was evident to all of us, and at the same time the sense of belonging to it, the love and the interest to preserve it … that is also the reason why we do research. This feeling makes us more aware of our (personal and professional) path and also of our responsibility." (transcribed from a free conversation)

Furthermore, scientists were aware that many ecological issues require public understanding and support, since environmental sustainability and governance can only be achieved through collective actions and behaviour changes. Environmental issues are characterised by social complexity: this demands for dynamic science-communication processes, allowing for the expression and integration of different knowledges, through the involvement of various actors from different backgrounds. Scientists can successfully share their views if they also integrate and embrace the richness and diversity of people's representations of nature and landscape (Buijs & Elands, 2013). These concepts became clear to most researchers, when dealing with people bringing different kinds of expertise (Figure 5):

"It is clear that the difference between scientists and the public is in the kind of expertise they have and the language they use: ecological research and environmental protection need all forms of expertise. Scientists should find the way to open themselves to other peoples' perspectives, in order to solve problems." (transcribed from a free conversation)

Members of the general public may actual hold rich mental concepts of ecosystem and biodiversity, although they might not be familiar with the scientific terminology (Fischer & Young, 2007). This was, for example, the case of Walser people – which were met during excursions in the Alps - a population accustomed to live in extreme environments and showing a strong tradition of resilience:

"Ecology is a universal concept, it is not only a scientific one. Looking at how people, especially inhabitants of remote alpine areas, like the Walser minority in Aosta Valley, behave in their daily life, face with environmental risks, often "acting ecologically" and showing resilient behaviours, with no scientific background, helps us recognizing and valuing different knowledges." (from an interview)

Figure 5. LTER researchers meet the local Authorities in Cairano, a small town (around 300 inhabitants) close to Avellino (Campania Region), during Mesothalassia. In the picture everybody is sitting under the tree of the main square, talking about ecology, from different point of views, in a productive and touching mutual exchange of knowledge and visions (Photo by Antonio Bergamino).

3.3 Reframing the relationship among knowledge, sensorial experience and emotions

Walking means "opening to the world", with the body and the senses: it is an act that reminds to human beings the humility and the beauty of their condition, and reconnects mind, senses and emotions (Le Breton, 2000). Moving slowly (by walk or by bike) allows a perception of time that we are not anymore used to and opens us to the possibility of observing nature at the right pace, recreating healthy, emotional bonds. It is actually by experiencing this "unstructured time" that researchers came across the last form of separation: the one among knowledge and emotions.

Scientists are emotionally involved in many aspects of their work. A passion for nature is often the reason why many of them enter the field of ecology. The emotional involvement may actually even improve the quality and usefulness of work, by increasing creative problem-solving abilities and a more comprehensive knowledge (Koppman, Cain & Leahey, 2015). This passion does not find a place in the usual process of science production and result publications, where strict rules hamper expressing this important emotional part of the work. During Cammini LTER, scientists instead expressed and rediscovered the strength of passion: speaking informally with people about research moved them back to the initial motivation of their work and to the importance that emotions had – and still have – also in everyday routine:

"During Cammini, we scientists re-discovered or confirmed the passion that move us in our work: this is not always perceivable in the daily routine, but emerged with new vitality while speaking with people about our researches and seeing our passion reflected in their eyes and words." (from an interview)

It is very important to be in touch with people and actively demonstrate passion when interacting with them: if linked with effective communication, it can reach successfully multiple audiences (Bickford, Posa, Qie, Campos-Arceiz & Kudavidanage, 2012). Moreover, including sensorial experience and emotions in science communication can make the difference in how scientists perceive themselves and the kind of knowledge they produce.

Although communication was aimed at informing about LTER initiatives and current environmental problems, the activity involved other aspects related to the ecological thought, such as affection, emotion, beauty and fascination of the natural landscape. Even if the scientific discourse usually avoids displays of emotion, scientists working in the natural resources sector often feel a strong emotional bond to the natural environment (Curtis, 2011; Curtis, 2012; Bickford, Posa, Qie, Campos-Arceiz & Kudavidanage, 2012). The knowledge of nature is actually not sufficient to know how to appreciate it: this involves mainly the human emotional sphere (Barbiero, 2014). Together with the science of ecology, also the "affective ecology", that part of ecological thought that involves the emotional connection with nature, needs to be developed (Barbiero 2011). Actually, as observed by Harding (2008), establishing an affective connection with the natural world brings with it the desire to know nature at a deeper level: ecological knowledge may stimulate a more intimate relationship with nature, which in turn may stimulate a greater desire for knowledge (Figure 6).

Figure 6. LTER researchers and citizens climbing the Mount Velino (The adventure of biodiversity). Walking together in silence allows the perception of the environment with all the senses, without the need of explanations (Photo by Sarah Gregg).

"Cammini is a material experience, a sensorial one, where not only facts but also values, passions, emotions and other elements, often elided by science, have a voice. Through Cammini we activated all our senses and reconnected knowledge and emotions. We could perceive, together with colleagues and with non-expert, the intimacy link with nature and landscape." (from an interview)

Finally, many people working in ecology often spend a lot of time working on disheartening issues, such as biodiversity decline, climate change, ecosystem collapse, fragility of territories, and feel the need for shifting from communication of problems to emphasizing beauty and wonder of the natural environment. During Cammini, the focus spontaneously moved from the problematic aspects related to ecology to the quality of the relationships with nature and people. This kind of "hearts on" communication can have a further strong benefit in the perception people have of the possible detriment stemming from losing biodiversity and healthy ecosystems.

"It is the mode of walking that makes a difference both in communication among us researchers, and with the public. Walking with people there, where they live, makes us open ears, heart, listen, and we learn to take (information), not only to deliver (them). But this makes also us more visible and less alienated!" (transcribed from a free conversation)

4. Conclusions

What is at stake for scientists when communicating ecology? This was the basic question that has driven these reflections about the initiative of informal communication of ecological research Cammini LTER. Is communicating just the transmission of scientific issues or is it a process where also values, identities, emotions, trust and responsibility among actors are implied? These issues, although born in a national and specific context (LTER), could be of more general value, contributing to the debates about science-society relationships.

Communication is generally considered a matter of performance, for which skills, practice, ability, predisposition and training are necessary. However, relationship and knowledge exchange are crucial, for which time, listening and mutual understanding are necessary. For the public, an improved understanding of the ecology and of the fragility of the territory where they live and of the research activities carried out on it may support awareness and care. For scientists, a deeper appreciation for the social context of their ecological research provides an opportunity to see how their work is perceived and/or acted upon in practice, but also how other perspectives are present. For both parties, a communicative relationship can help overcome stereotypes and/or bring to a greater appreciation of the others' perspectives, constraints and values with respect to conservation and biodiversity.

Communicating ecology can be an opportunity for building new qualities of knowledge and for creating a shared civic culture, a participative setting, able to make all players feel mutual responsible and contribute to the solution of particular socio-ecological challenges. This appears particularly relevant dealing with the present environmental problems, which are not only ecological but also socio-ecological and cultural.

Cammini LTER, whose realization in 2015 we have described in this paper, could in the future benefit from findings in the ecological psychology and environmental education, where a growing body of literature (Christie, Beames & Higgins, 2016; Nazir & Pedretti, 2015) is re-conceptualizing aims and practices of traditional relationship with the public. Walking and observing in natural environments, indeed, induce changes of posture and visions that do not usually fit into our thought patterns. Looking for the most suitable instruments to respond to the current global crisis on the Planet, and to

foster a sustainability view, also concepts such as "ecological identities", defined as discovering the "sense of self as part of an ecosystem"(Olivos, Aragonés & Amérigo, 2011), "enactivism" as a mode of learning and knowing, considering the fact that "living means first and foremost to be animate, moving" (Gray & Colucci Gray, 2018) should be explored.

It is however not an easy goal. During conversations among scientists, many often complain that science communication activities push them out of their comfort zone, are time consuming and too challenging for most of them being asked to work under the constraints of "publish or perish". As a result of this reasoning, communication, although interesting and stimulating, is a matter to should be left to professional communicators.

Reflections during Cammini convinced us that it is crucial that researchers engage with the public at first hand, reflecting not only on their communication practices, but also on the modern science model of production itself. Through this direct activity and responsibility, own thoughts and reflections involved in this activity can be stimulated and activated. Engagement with the public, where not only scientific content but also values, identities, emotions, trust and responsibility among actors are involved, can result in deeper awareness of the role of each actor in the management and care of the territory and provides an opportunity for discussing the necessity of a new quality of ecological communication and relationship with society, more open, empathic, responsible and collaborative.

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