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Short communication

Challenges for biodiversity monitoring using citizen science in transitioning social–ecological systems

Jacqueline Loos[a,*], Andra I. Horcea-Milcu[a], Paul Kirkland[b], Tibor Hartel[c], Márta Osváth-Ferencz[d], Joern Fischer[a]

[a] Leuphana University, Faculty of Sustainability, Scharnhorststrasse 1, 21335 Lüneburg, Germany
[b] Butterfly Conservation Scotland, 24 Allan Park, Stirling FK8 2QG, Scotland, United Kingdom
[c] Sapientia Hungarian University of Transylvania, Department of Environmental Science, Calea Turzii 4, Cluj-Napoca, Romania
[d] Babeş-Bolyai University, Faculty of Biology and Geology, Clinicilor Street 5-7, Cluj-Napoca, Romania

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ABSTRACT

Biodiversity monitoring requires sound data collection over large temporal and spatial scales in order to inform policy and conservation management. Citizen science programmes, if designed appropriately, can make valuable contributions to data collection and analyses. Moreover, citizen science has potential for both environmental education and civic participation. Recommendations on effective citizen science are available in the literature, but most existing work has come from relatively rich, industrialized countries. By contrast, there is very little knowledge on citizen science projects in transitioning economic, social and cultural settings. This paper seeks to adjust this deficit by contributing insights from our attempt to initiate a new monitoring scheme in Romania. We draw on our experience of conducting workshops, training events and camps to strengthen citizen engagement in a butterfly monitoring scheme, and discussions with many stakeholders engaged in other monitoring programmes inside and outside of Europe. We highlight four general themes that are worth considering when initiating new citizen science projects in socio-economically challenging settings: (i) engaging citizens requires a combination of formal and informal support; (ii) a culture of volunteering requires education as well as building capacity and confidence; (iii) citizen science needs active integration of both national experts and local stakeholders; and (iv) successful monitoring schemes require effective leadership. We conclude that particular attention should be paid to the cultural legacies of the target area.

Citizen science: An opportunity for long-term ecological monitoring

In light of global biodiversity decline, it is important to document the changing state of ecosystems in order to provide a solid evidence base for policy and management. Monitoring programmes, if designed appropriately, can deliver valuable data and results (Schmeller et al. 2009), but they require the long-term implementation of standardized survey designs (Legg & Nagy 2006; Yoccoz et al. 2001) – a demand that can rarely be met by conventional research projects and environmental agencies (Bell et al. 2008).

One cost-effective solution to this problem is to implement citizen science projects. Such projects involve volunteers with different levels of skill and engagement in monitoring activities (Bonney et al. 2009; Schmeller et al. 2009), such as gathering empirical data over large spatial and temporal scales (Bonney et al. 2014; Donald et al. 2007; Tulloch et al. 2013). The use of citizen science projects for monitoring purposes is, however, sometimes questioned due to its limited ability to contribute to scientific outcomes (Bell et al. 2008; Genet & Sargent 2003). By necessity, sampling designs are often more simplistic than in professional monitoring schemes (Danielsen et al. 2009; Engel & Voshell 2002), and may generate lower quality data. Nonetheless, citizen science can make a valuable contribution to long-term biodiversity monitoring, given an appropriate design and data validation. Furthermore, involving laypeople in science projects may enhance civic engagement and activity (Leach et al. 2005), and thus has the potential to raise public awareness (Bell et al. 2008; Silvertown 2009), for example, of the loss of biodiversity.

Successful volunteer-based monitoring schemes in industrialized countries have typically focused on charismatic species such

* Corresponding author. Tel.: +49 41316772296.
E-mail address: loos@leuphana.de (J. Loos).

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as birds (Sullivan et al. 2009) or butterflies (Pollard & Yates 1993; van Swaay et al. 2008). Although valuable information on the establishment and organization of monitoring schemes exists for relatively rich (typically "Western") countries, the specific challenges of initiating monitoring schemes in less wealthy countries, or ones with turbulent political histories, have received little attention (Danielsen et al. 2003).

Compared to "stable" Western economies, the process of implementing citizen science projects in transitioning countries should be expected to be different. This could be partly explained by a lack of money, time and taxonomic skills, but it is also due to mental, cultural and socio-economic differences arising from the overall context characterising transitioning countries. For example, the success of democracy is known to depend on changes in public mentality towards civic values (Sztompka 1993). However, in some Eastern European countries, such as Romania, recent studies point out that interpersonal trust and civic participation levels are very low (Mikulcak et al. 2015). In addition, people seem to favour more individualistic values, and social capital is often low (Badescu et al. 2004; Sztompka 1993). Although the civil society is relatively developed, the support it receives from citizens has yet to grow (Badescu & Sum 2005) and is facing difficulties in transferring democratic values to the larger population (Badescu et al. 2004). Finally, corruption is known to seriously affect investment rates in public and community goods, thus reinforcing mistrust in formal and even informal institutions (Mikulcak et al. 2013). All these factors combined make it challenging to engage Romanian citizens, and probably also citizens from some other transitioning contexts (Anthony & Moldovan 2008). Filling the knowledge gaps on how to approach citizen science projects in such settings is important, because the countries of interest are often characterized by high biodiversity, which is likely to be threatened by economic transition.

Citizen science in challenging socio-cultural conditions: An example from Romania

Here, we summarize insights from a recent project aiming to initiate a volunteer-based butterfly monitoring scheme in Romania, Eastern Europe (Loos & Kirkland 2014). Citizen science could be a valuable participatory process in rapidly changing countries such as Romania (Stringer et al. 2009), which have high biodiversity, but (unlike some Western countries) may lack financial resources to employ professionals to conduct large-scale monitoring. However, in such settings, citizen science may also face some unique challenges, because it usually draws on an empowered and active civic perspective (Leach et al. 2005), which could be missing in societies that have only recently became democratic. Thus, the success of citizen science projects may depend on the support available from civic society as well as the degree of civic participation and engagement.

Romania has undergone a series of major changes in the past 30 years, including the collapse of communism in 1989. Despite recent improvements, Romania still has one of the weakest economies in the European Union (EU). The re-orientation of the post-communist country towards the EU has divided the society into "winners" and "losers" (Tucker et al. 2002). Many of the losers live in rural areas and continue to practice traditional semi-subsistence farming. The unstable conditions and the increased access to the free market may have encouraged utilitarian (Tucker et al. 2002) and opportunistic attitudes and excessive selfishness in society (Sztompka 1993), so that corruption, nepotism and low social capital are currently widespread (Newton 2001; Slangen et al. 2004). At the same time, Romania has high levels of cultural, ethnic and biological diversity and supports many endemic species (Ioras 2003), as well as species that are endangered or extinct in Western Europe. The conservation of Romania's biodiversity is of high interest at the European level (Schmitt & Rákosy 2007), but Romania's natural environment has come under intense pressure since its 2007 accession to the EU (Mikulcak et al. 2013). As in many other relatively poor countries, Romania has no official national biodiversity monitoring schemes.

In the following, we reflect on the successes and failures of our endeavours to establish a volunteer-based butterfly monitoring scheme in Romania (2011–2014). To recruit volunteers and experts we organized several workshops, species identification training events and butterfly camps, and promoted butterfly monitoring at national annual meetings of lepidopterists in 2012 and 2013. Throughout this time, we had open discussions with participants as well as with coordinators of other monitoring schemes from countries inside and outside of Europe. Based on our experiences, we summarize four key considerations that we believe to be critical when establishing citizen science projects in transitioning social–ecological systems.

Engaging citizens requires a combination of formal and informal support

Volunteers from countries with well-established economies often contribute their own financial resources to citizen-science activities (Dickinson et al. 2010). However, in poorer countries, people may not be able to afford materials and travel costs. Hence, financial support is needed to cover materials (such as field guides and butterfly nets) and travel costs. In the absence of government funding, external fundraising therefore becomes important. This, in turn, may require an official institution to be founded or involved, such as a legal association or a charity. Such an official body also can provide formal attendance certificates to participants of workshops or training events, which can be shown to employing institutions, thereby encouraging further collaboration and support.

Despite the likely need for an official institution to be involved, identifying (or even founding) a suitable institution can be difficult in countries experiencing economic challenges. For example, in Romania, socio-cultural legacies from the communist era have resulted in high levels of mistrust (Sztompka 1993), which hinders collaboration among established organizations. Setting up new institutions can also be problematic because of unclear bureaucratic structures and potential new actors being perceived as competition to established ones, even among non-governmental organizations. To gain trust, the process of setting up an official participatory network can benefit from building on informal social capital (Pichler & Wallace 2007), and from involving local stakeholders in a way that is transparent to existing interest groups.

A culture of volunteering requires education as well as building capacity and confidence

Romania does not have a pronounced culture of volunteering (Badescu et al. 2004), partly because the notion of volunteering was abused during communism, when people were coerced to carry out activities for the community. However, our activities have suggested that it is possible to improve the negative image of volunteering: after a relatively short time and a few workshops and meetings, we observed an emerging interest to participate in our initiative, as well as in other environmental projects. The desire of volunteers to contribute to conservation initiatives was related to a perception that these provided opportunities for socializing, learning and improving knowledge. The latter aspect appeared to be of particular importance to younger volunteers seeking careers in biodiversity conservation.