Merging science and arts to communicate nature conservation

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A B S T R A C T

As a response to overall negative attitudes on nature conservation, Latvian scientists and artists launched a new initiative to communicate biodiversity. Unlike previous efforts, this initiative also included arts (poetry, music, dance and photo/video) as part of the information campaign. This project, named Nature Concert Hall, has been very successful between 2006 and 2012 in terms of receiving national and international recognition; this paper aimed to evaluate its efficiency in increasing the public’s knowledge and awareness of nature conservation issues and pro-environmental behaviour. We used an electronic web-form survey to investigate the views of the Nature Concert Hall’s audience. The collaboration between artists and scientists clearly led to larger audiences: 53% of enquiry respondents would not have attended if there was only the ‘scientific component’ and another 34% were uncertain about their choice. Overall, 80.8% of respondents noted an increase in knowledge on biodiversity issues after attending Nature Concert Hall and 43.4% of respondents reported an increase in their pro-environmental activities. Significant predictors of increased knowledge were gender, profession and the main living location (men, people with creative professions such as artists and scientists, as well as people residing in the countryside, were less likely to learn something new). Significant predictors of increased pro-environmental behaviour were age, the number of events participants attended and the increase of knowledge (older people and those who attended more Nature Concert Hall events were more likely to improve their pro-environmental behaviour, as well as those people who also reported increase of knowledge).

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1. Introduction

Scientific knowledge is important to raise environmental concern and subsequent pro-environmental behaviour (Arcury, 2008; Fransson & Garling, 1999; Sia, Hungerford, & Tomera, 1986; Schahn & Holzer, 1990), however, traditional methods of increasing the general public’s knowledge about the environment are poorly equipped to reach a further goal—public participation leading to pro-environmental action (Lindenfeld, Hall, McGreavy, Silka, & Hart, 2012). Scientists still struggle to communicate their research to the general public, and often find that their academic arenas of practice do not encourage direct public engagement (Curtis, Reid, & Ballard, 2012). Presenting facts alone is less likely to result in long-term changes in feelings and behaviours (Jacobson, McDuff, & Monroe, 2007; Sylwester, 1994).

Alternatively, collaboration between scientists and other partners and stakeholders using different platforms about biodiversity information ensures mutual learning and fact-finding (Lindenfeld et al., 2012). One possible option for environmental communication is the linkage with the arts that have many qualities which enhance information transfer and learning. The celebratory aspects of the arts bring a necessary balance to environmentalism by lightening its often confrontational, complicated and therefore difficult messages by emotional creativity (e.g. Brangan, 2005; Latour, 2004). Artists are able to communicate with larger audiences and the arts, together with science, can make the ‘invisible visible’ (Curtis, 2009). Although the role of the arts in communicating issues has a long tradition in the humanities, it has been often overlooked by scientists (Belfiore & Bennett, 2007), especially when dealing with the facts and findings that are neither attractive nor positive, but still important for society.

About ten years ago in Latvia, Northern Europe, increasing public knowledge of biodiversity and nature conservation was particularly necessary following Latvia joining the European Union in 2004. This meant that Latvia had to increase its network of protected areas from 8% of its national territory to 11.9% (Opermanis, Racinskas & Aunins, 2008). This means that many of Latvia’s inhabitants found themselves restricted in their use of natural resources and this raised tension and a wave of negative attitudes towards the need to protect biodiversity. It is known that in many countries of the...
European Union the levels of acceptance of new nature protection programmes, e.g. the Natura 2000 network of protected areas, is low, particularly in the new Member States, a group to which Latvia belongs (Grodzinska-Jurczak & Cent, 2011; Pavasars, 2013). Therefore in 2006, scientists and artists together launched a new initiative to communicate biodiversity. Unlike previous biodiversity communication efforts, this initiative included an arts element as part of the information campaign. The initiative was named Nature Concert Hall (“Dabas KoncertZāle” in Latvian). The aim was to improve the general public's knowledge about nature and the need to protect it and to promote pro-environmental behaviour. Pro-environmental behaviour so far has been defined quite broadly, for example, as behaviour that minimizes negative impacts on the environment (e.g. Kollmuss & Agyeman, 2002; Steg & Vlek, 2009). We use the term widely also in this paper, however, since Nature Concert Hall mainly speaks about nature conservation issues, the expected change in behaviours will mostly fall under much narrower range of possible actions, more or less, directly related to nature conservation.

Given that environmental information, knowledge and awareness alone do not always predict pro-environmental behaviour (e.g. Kollmuss & Agyeman, 2002), a central concept of Nature Concert Hall was to develop the environmental self-identity of participants through new and direct nature experiences, raising connectedness with nature and site-attachment—factors which were known to link information and knowledge with behavioural change (Schultz, 2002). Thus, Nature Concert Hall's events were always held in natural settings, such as forest, seacoast or riverside, in a place carefully selected for a specific topic but also able to withstand the short-term impact of the presence of thousands of participants. For musicians and other artists, this meant breaking out of traditional concert venues and for scientists to think how to present their knowledge to the public.

Over the years, Nature Concert Hall has received a number of awards: Latvian Environmental Science Award for an innovative way of presenting environmental science in Latvia (2007); Latvian Music Award for the best instrumental album in 2009 and 2011; Latvian Music Award for best concert film (2010); Best Environmental Campaign in the European Union (2012, Green Spider Network competition); and, was honoured to represent Latvia at the World Expo in Shanghai in 2010. Therefore, Nature Concert Hall has been recognized and well received at various levels, yet, its impact on increasing pro-environmental behaviour was still to be demonstrated, which is the subject of this paper.

As environmental and nature conservation literature is largely silent on the role of arts in mass communicating science (Curtis et al., 2012; Jacobson et al., 2007), this study aimed to analyse (1) how the ‘artistic component’ of the event helped to attract potential audiences, (2) if Nature Concert Hall had an impact on increased knowledge about nature, (3) if Nature Concert Hall had inspired people to move toward pro-environmental behaviour, and (4) what were the factors that predicted increased knowledge and pro-environmental behaviour. Additionally we wished to share experience arising from seven years of Nature Concert Hall on various theoretical and practical aspects of implementing biodiversity communication which may be of value to conservationists elsewhere in the world.

2. Methods

2.1. Format of the Nature Concert Hall events

DK combined several disciplines to raise the public's awareness about biodiversity issues and mankind's responsibility to maintain biodiversity for future generations. Nature Concert Hall brought together science, music, poetry and visual images (still images at first but later developed towards hi-tech video installations and scenography). Nature Concert Hall did not focus on a specific target audience but aimed to attract audiences of all ages, nationalities and interests. Each year Nature Concert Hall focused on a wider biodiversity story and selected a 'hero’—usually a species – that introduces the problem to the audience. Each year the events took place at a different location in a different municipality and within different regions of the country to attract more and different audiences. The logic and rationale of the ‘hero approach’ is summarized in Table 1.

Ecopsychologists assert that a disconnect from nature is an important cause of pro-environmental inaction, and that regaining a sense of connectedness should realign our values towards pro-environmental stewardship (Reser, 1995). Place attachment to humans has been recognized as a possible predictor of pro-environmental behaviour, but the results have been unclear. Scannell and Gifford (2010) distinguished civic and natural attachment, and analyses proved that only the second predicts pro-environmental behaviour. In the context of Nature Concert Hall, the heroes were selected to create such ‘natural attachment’. Contrary to most other biodiversity campaigns where heroes are often endangered and rare species which live somewhere far away and which probably most of the audience will never see in their lifetime, Nature Concert Hall used common species that virtually everyone can see and meet, to introduce general problems, including the issues about endangered and rare species. It was expected that such natural attachment through personal experience should create a necessary bond between the participants and nature, thus eventually leading to increased pro-environmental behaviours.

Each time, after a ‘hero’ was selected the scientists and artists had a number of exchanges of views on how and where best to channel the targeted messages to the public. A critical decision each year was the choice of locations where the events were to take place. An important factor was a trade-off between the willingness to be as much as possible in nature and accessibility. An additional factor, however, was the readiness of the local community to provide support, both voluntary (in-kind contributions of staff time, materials) and financial (no direct cash contributions, but through covering costs of security staff, facilities and others), to the event. The twelve events held between 2006 and 2012 have a reasonable distribution across Latvia, although some gaps remain (Table 2 and Fig. 1).

The events, given Latvia’s climate, were scheduled in the summer (June-August period) when the observation of wild species is easiest and the use of electric equipment in open-air are safest. Events were advertised locally and nationally via various mass media but its extent, particularly in early years, was rather limited due to insufficient funding. The potential audience closest to the performance locations was informed through posters that were displayed in local post offices and on information bulletin boards. In later years, Nature Concert Hall prepared special audio information (informational ‘commercials’) which was aired on local radio stations prior to the event. All Nature Concert Hall’s events were free of charge and thus fully depended on a variety of financial contributors and government support.

All events followed an established pattern: the audience was invited to arrive in the afternoon/early evening. At first people were involved in ‘scientific’ discussions through workshops in tents and in the field, led by professionals from scientific institutions and nature non-governmental organizations (NGO, Fig. 2). The ‘scientific component’ mainly focused on presenting interesting information through direct experience and revealing possible conservation problems. Closer to sunset, the ‘artistic component’ began dedicated to the same theme (a hero, a problem) as the scientific workshops, starting with poetry and ending with a musical
Table 1
Heroes and problems tackled by Nature Concert Hall in chronological order.

<table>
<thead>
<tr>
<th>Season</th>
<th>Hero</th>
<th>A wider context</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>Hermit beetle</td>
<td>Insect variety and behaviour. Protection of old trees to protect dependent insects</td>
</tr>
<tr>
<td>2007</td>
<td>Chaff-chaff Phyllostegia collybista</td>
<td>Birds close to us. A bird and a man in a mirror: how many Latvians have bird surnames? What simple actions can we take to protect different species?</td>
</tr>
<tr>
<td>2008</td>
<td>Caddisfly Hydropsychidae instabilis</td>
<td>Reveals freshwater habitats and the life of caddisflies which are good bio-indicators of water quality</td>
</tr>
<tr>
<td>2009</td>
<td>Lichen Graphis scripta</td>
<td>Introduces the most common lichens that still indicate good air and natural forest quality. Graphis's appearance on tree barks resembles human writing, as observed in its scientific name.</td>
</tr>
<tr>
<td>2010</td>
<td>Travertine Calcium carbonate</td>
<td>For the first time a hero represented the abiotic element of an ecosystem. The event informed how they were used in the past and potential uses in the present-day</td>
</tr>
<tr>
<td>2011</td>
<td>Seaweed Fucus vesiculosus</td>
<td>Problems of the Baltic Sea and diversity of the Baltic Sea inhabitants; the importance of the salinity which makes this sea unique, and the role of the a seaweed as a plant which provides a home and nesting area for aquatic species</td>
</tr>
<tr>
<td>2012</td>
<td>Fire-bellied Toad Bombina bombina</td>
<td>The revealed amphibian world and a chance to view and hear the fire-bellied toad in its habitat. The balance between agricultural activity and the species which thrive as a result</td>
</tr>
</tbody>
</table>

Table 2

<table>
<thead>
<tr>
<th>Season</th>
<th>Number of events</th>
<th>Estimated number of participants</th>
<th>Number of returned enquiries and percentage from the participants (brackets)</th>
<th>Audio-visual material produced</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>1</td>
<td>500</td>
<td>55(11.0)</td>
<td>None</td>
</tr>
<tr>
<td>2007</td>
<td>2</td>
<td>1500</td>
<td>77(5.1)</td>
<td>CD/DVD</td>
</tr>
<tr>
<td>2008</td>
<td>2</td>
<td>4000</td>
<td>103(2.5)</td>
<td>CD</td>
</tr>
<tr>
<td>2009</td>
<td>2</td>
<td>5000</td>
<td>150(3.0)</td>
<td>CD/DVD</td>
</tr>
<tr>
<td>2010</td>
<td>2</td>
<td>7000</td>
<td>204(2.9)</td>
<td>CD</td>
</tr>
<tr>
<td>2011</td>
<td>2</td>
<td>11000</td>
<td>247(2.2)</td>
<td>CD</td>
</tr>
<tr>
<td>2012</td>
<td>1</td>
<td>4500</td>
<td>160(3.5)</td>
<td>CD</td>
</tr>
</tbody>
</table>

Fig. 1. Location of Nature Concert Hall events in Latvia 2006–2012.

Performance (on average 1.5 h in total) combined with photo, video performances and dance. Nature Concert Hall started by experimenting with ambient music, but as each year progressed and new heroes from nature were introduced, the musicians expanded their performance by combining and integrating different styles such as alternative rock, classical, electronic and traditional (world) music which could better reflect the features showcased. The illustrative video story, which accompanied the music, was inspired by the main ‘hero’ and by the environment in which the concert was held for the specific event. Design of the concert stage, upon which the video projections were shown, was also developed each year to suit the venue and the topic. Through association, the video content illustrated different processes and events in nature; it created the mood and transported the audience to a different time or place. Official videos of Nature Concert Hall are
available at: http://www.youtube.com/watch?v=lFoID1xKxs and http://www.youtube.com/watch?v=8PTcc5c0Pc8.

Each event location was agreed with the national nature conservation authorities. During site selection special care was paid to ensure that a short intrusion of a few thousand people would not cause significant harm to the wild species or natural habitats. Likewise, after the concert, all waste was efficiently removed from the Nature Concert Hall location.

2.2. Sampling methods

We used SurveyMonkey®, an online survey and questionnaire tool, to obtain responses and feedback from the Nature Concert Hall’s audience. The main reason for selecting this method was minimal cost, convenience to participants and time-saving (see, e.g. Sax, Gilmartin, & Bryant, 2003).

The questionnaire was available on line from 21 April to 15 July 2013. During this period we received 538 responses but quality checking reduced this to 524. The link to the enquiry was advertised and provided through Facebook, draugiem.lv (largest Latvian social network), personal e-mails to all people known to have attended Nature Concert Hall events and through a variety of other web-pages (e.g. NGOs and municipalities where the events were organized). Use of the Internet in Latvia is relatively high: 67% of households are reported as users and problems of a technical nature should not exist as Latvia has the fastest Internet in Europe and fourth fastest in the world (Latvian Internet Association, 2013). Nevertheless, we understand that using a single technique to collect information may have led to potential non-response biases (Couper, 2000; Sax et al., 2003). To keep control at least on possible gender bias, we estimated the gender proportion of Nature Concert Hall attendees from 12 random group images each from 12 different Nature Concert Hall events and compared them with gender proportions from the questionnaire responses.

2.3. Contents of the questionnaire

The questionnaire was developed to serve multiple purposes. Apart from the information used in this paper, data and knowledge gleaned from the survey was also used for attracting financial contributors and also to study certain aspects of eco-tourism with the link to Nature Concert Hall (not covered in this paper). Overall, 23 questions were included, nine were open-ended. Other questions, except age and profession, involved a selection of reply options from a drop-down list. We chose not to make the inquiry longer in order to avoid increase of time necessary for responding and thus possibly reducing the response rate. Pre-testing indicated that the shortest possible time to complete the entire questionnaire and answer at least a few short open-ended questions would require 6–7 min.

To study possible event attendance without arts, the questionnaire asked if respondents would participate in such an event if there was no ‘artistic element’. The questionnaire also included a question about the distance (categories to be selected from a drop-down list, see Fig. 3) between each Nature Concert Hall event location and respondent’s residence to test whether this distance per se could have been a factor determining attendance. In addition, outside this questionnaire, attendance figures were obtained from ‘only scientific’ events that were held recently in Latvia to promote biodiversity conservation and the numbers of participants

Fig. 2. Different forms of ‘scientific’ part in Nature Concert Hall: (a) field excursion (Calcium carbonate, 2010), (b) examining aquariums (Fucus vesiculosus, 2011), (c) field laboratory (three generations learning together, Graphis scripta, 2009) and (d) exercises for children (Phylloscopos collybita, 2007).

Fig. 3. Effect of distance between respondent’s residence and Nature Concert Hall event location on attendance rate ($\chi^2 = 73.8; d.f. = 3; P < 0.0001$). Respondents were asked to indicate distance to both attended and not-attended events.
were compared with those of Nature Concert Hall. The numbers of attendance were based on a combination of direct counts of arriving participants at the entrance at the beginning of the event, counts of participants from group photographs and counts of vehicles (cars and bicycles) arrived and parked. It is difficult to get exact statistics about audience size from ticketless events, especially when not all participants arrived at the same time and used different transportation means. Therefore the numbers given in Table 2 should be considered approximate.

To study Nature Concert Hall’s impact on people we did not ask about current knowledge and behaviour, as we had no such comparative data from the period before Nature Concert Hall. Instead, we asked whether respondents thought they gained new or increased their existing knowledge and/or launched new or increased existing pro-environmental behaviour as a result of attending Nature Concert Hall. Thus, negative response in this case meant both that an attendee had no knowledge (behaviour) before the event and still has no knowledge (behaviour) or had such knowledge (behaviour) before but it did not change as a result of the Nature Concert Hall. We considered that a respondent increased their knowledge if under the respective question she/he clicked upon at least one of the following offered options: ‘as a result of attending Nature Concert Hall, I better understand processes in nature and the need to protect it’, ‘I read/watch materials (books, films) about biodiversity more often’ and ‘I spend more time in nature’. The latter category was associated with an increase of environmental self-identity (see Section 4) because we consider ‘being in nature’ itself as an act of exploration and establishment of a bond with nature. If this happens more often as a result of Nature Concert Hall, the aim would be achieved. In our study we did not separate environmental knowledge and attitude as in most cases both are consistently and positively related (Arcury, 2008).

To date, pro-environmental behaviour has been defined quite broadly, for example, a behaviour that consciously seeks to minimize the negative impact of one’s actions on the natural world (e.g. Kollmuss & Agyeman, 2002; Steg & Vlek, 2009). As in our study, we dealt mainly with biodiversity, pro-nature behaviour very often has a broader meaning than merely starting a new activity, i.e. it could also be to stop doing something harmful or do something differently in a more sustainable way. We considered that a respondent became pro-environmentally active when at least one of the following options was clicked: ‘I personally did something useful for nature that I learned at Nature Concert Hall’, ‘I used the new knowledge in my profession’ (e.g. decision-making, teaching), ‘I advised others about what and how to do’, ‘I donated money so that others can do’, ‘I joined a nature protection NGO’. Given that certain people and groups cannot perform pro-nature actions because of different situational barriers (see Section 4), even if they are motivated, we think that even offering advice to others may be a powerful pro-environmental behaviour resulting in concrete actions because in a small country such as Latvia, the informal mouth-to-mouth knowledge dissemination between individuals is sometimes more efficient than formal communication. Pro-environmental behaviours can be both direct and indirect (van der Werff, Steg, & Keizer, 2013), so, we also recognized any form of active transfer knowledge gained at Nature Concert Hall as pro-environmental behaviour. In the same way, we think that joining a nature conservation NGO, and thus, paying a membership fee is also a pro-environmental action. Referring to ‘I personally did something useful that I learned in Nature Concert Hall’ (see above) we refer to a concrete action by an individual that we defined quite broadly from general behaviour to minimize impact of forestry, agriculture, water and air pollution to biodiversity to concrete actions like avoiding the cutting of large trees and leaving deadwood in the forest, making a nest-box for a bird, cutting grass from the centre of the field to edges to let birds and other animals escape, and many more. In both response variables (i.e. about knowledge and behaviour) there was a clear option to click ‘no’ if respondents had no benefits or took no action.

In our study, we relied on respondents’ self-assessments as it was virtually impossible to measure actual behaviour. Although some studies revealed that self-reports are adequate indicators of actual behaviour, others reported low correlations between self-reported and observed behaviour (Steg & Vlek, 2009). Environmental self-identity reflects how you see yourself. Thus, if respondents only think they have acted pro-environmentally, this also confirms their self-identity to people that do the right thing. So, it is highly likely that the person will continue acting as a pro-environmental activist even if at the time of responding his/her self-assessment this was not really correct (van der Werff et al., 2013).

Developed response and predictor variables to study effects on environmental awareness and action are given in Table 3. We took into consideration a number of possible predictor variables given by Fransson and Garling (1999): age; gender; residence; and, education/profession. Regarding residence, the survey asked respondents to state both their primary and secondary residence. We felt this important as in Latvia many people move to summer/country homes for extended periods. To further study effects of residence, we developed two predictors: the main living location (LIVEMAIN) and the ‘closest to nature location’ (LIVENAT) which was the living location stated in a gradient farm–village–town considering both primary and secondary living locations. If the first variable can be interpreted as the place where a respondent spends most of his/her time, then the second was interpreted as how close to nature a respondent spends at least a part of his/her time assuming the farm being closest and the town being most remote. For profession we used two variables: PROFENV; and, PROF. In the first case, we wanted to know if the fact that a respondent is already working in environmental protection affected their ability to gain new information and further pro-environmental activity. In the second case, we tried to broadly classify the professions of all respondents; ‘administration’ typically included civil servants; ‘communication’ (and education) included professions communicating daily with people such as teachers and journalists; under the ‘creative’ category we included people such as those who created Nature Concert Hall: scientists; and, artists.

2.4. Data analysis

To model the factors that affected environmental awareness and pro-environmental behaviour, we created a data matrix where the entry unit was a questionnaire. We made two separate models explaining each of the response variables, referred to as “KNOW model” and “BEHAV model”. For this study we had to reduce the sample size to 428 because of incomplete records by deleting all that had missing values in at least one variable listed in Table 3.

For the KNOW model we initially tested different combinations of predictors in a generalized linear modelling (GLM) framework using the binomial family and logit link function and using Akaike’s Information Criterion (AIC) to compare the models. Additionally, corresponding generalised linear mixed models (GLMM) were tested using factors from the GLM model as fixed effects factors and not used multi-level factors as mixed effects factors in GLMM. If intercept variance was not significant, the corresponding GLM model was preferred. For the “BEHAV model” we also included KNOW as a potential predictor variable along with all others that were tried for “KNOW model”. From the competing models we chose a model consisting of significant and near-significant predictors (P<0.1) and having the smallest AIC.
Table 3  
Variables used to study factors affecting increase of knowledge and pro-environmental behaviour using Generalized Linear Models. Two models were developed: one with response variable KNOW and other with response variable BEHAV. Same predictor variables were used for both models. Only full records (responses) without missing values were included (n = 428).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Variable type</th>
<th>Count/basic statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response KNOW*</td>
<td>Indicates whether respondents obtained new or better environment knowledge</td>
<td>Response</td>
<td>No 66, yes 362</td>
</tr>
<tr>
<td>BEHAV</td>
<td>Indicates whether respondents started or increased pro-environmental behaviour</td>
<td>Response</td>
<td>No 230, yes 198</td>
</tr>
<tr>
<td>Predictors AGE</td>
<td>Respondent’s age</td>
<td>Numeric</td>
<td>Mean 34.7 (min 12, max 70)</td>
</tr>
<tr>
<td>GENDER</td>
<td>Respondent’s gender</td>
<td>2-level factor</td>
<td>Mean 90, women 338</td>
</tr>
<tr>
<td>EDU</td>
<td>Respondent’s education</td>
<td>2-level factor</td>
<td>University 359, other 69</td>
</tr>
<tr>
<td>PROFENV</td>
<td>Respondent’s profession, is it linked with environment protection?</td>
<td>2-level factor</td>
<td>No 383, yes 45</td>
</tr>
<tr>
<td>PROF</td>
<td>Respondent’s profession, broad groups</td>
<td>7-level factor</td>
<td>Administration 100, agriculture 10, business 48, communication 97, creative* 59, engineering 26, other 88</td>
</tr>
<tr>
<td>LIVEMAIN</td>
<td>Main living location, town, village, farm</td>
<td>3-level factor</td>
<td>Town* 284, village 102, farm 42</td>
</tr>
<tr>
<td>LIVENAT</td>
<td>‘Closest to nature’ living location considering also secondary (seasonal) locations</td>
<td>3-level factor</td>
<td>Town* 166, village 143, farm 119</td>
</tr>
<tr>
<td>EVENTS</td>
<td>Number of DK events attended</td>
<td>Numeric</td>
<td>Mean 2.1 (min 0 max 7)</td>
</tr>
</tbody>
</table>

* Acts as predictor variable in the ‘BEHAV model’.  
* Intercept in final models (Table 5).

All calculations were done using the R 3.0.1 statistical software package (R Core Team, 2013); for mixed models an R package “lme4” (Bates et al., 2013) was used.

3. Results

3.1. Attendance and impact of Nature Concert Hall on awareness and action

The collaboration of scientists and artists clearly led to a larger audience: 280 (53%) of enquiry respondents said that they would not come to Nature Concert Hall if there was only the ‘scientific element’ and another 177 (34%) were uncertain about their choice. Nevertheless, the audience size constantly grew from year to year thus indicating that it took some time to gain popularity and grow the audience (Table 2). Attendance rate constantly decreased with increasing distance between respondent’s residence and Nature Concert Hall event location suggesting that Nature Concert Halls were largely regional events (Fig. 3).

We also obtained attendance data on several ‘science-only’ events in Latvia with the same aim as Nature Concert Hall—to promote biodiversity conservation. One of the largest annual campaigns, European Bird Watch Day, attracted from 450 to a maximum of almost 700 participants between 2005 and 2013 in Latvia, however, in this case all participants were not tied to a single place. Another annual event, ‘The Bat Night’, taking place in Kemeri National Park, usually attracted around 100 participants with a maximum of 200. This suggests that only thanks to Nature Concert Hall event format organizers were able to address thousands of people in a single event at a single location (Table 2).

Overall, 80.8% respondents noted an increase in knowledge and 43.4% respondents reported an increase in pro-environmental activity. Increase of knowledge and increase of pro-environmental action are not necessarily related as a person could have previous knowledge and awareness but the Nature Concert Hall event may have impacted only action, which is confirmed by this study as 21 respondents increased action but not knowledge/awareness (10.6% of all those reporting action). Therefore, we further developed separate models for two benefits: knowledge and action.

3.2. Possible effects of non-response bias

Basic statistics of the main variables (Table 3) indicate the possible presence of non-response biases. The first that becomes apparent is the uneven representation of males and females in the feedback. Males responded disproportionately at lower rates than attended the Nature Concert Hall events (Table 4). According to gender proportions obtained from images, we should have received feedback from another 211 men, assuming the number of female respondents remains the same. There were no differences between men and women by age groups (interval = 10 years; \(\chi^2 = 7.89; \text{d.f.} = 5; p = 0.16\). Assuming the proportionality of the same answers of non-responding men as of responding men, the correction of overall estimate was 78.7% for knowledge and 43.9% for activity, i.e. the difference from the initially obtained figures was not significant.

Another surprising result is the low proportion of respondents without a university education (only 16% of all respondents). However, it is not certain if this is actual non-response fact or the reality that Nature Concert Hall events are indeed ‘elitist’. Another contradicting observation is that very few respondents noted working in the field of agriculture (Table 3) while Nature Concert Hall events notably attracted a lot of local people (Fig. 3). Given that most Nature Concert Hall events took place far from towns, in the deep countryside, it is therefore unusual that so few farmers apparently attended.

3.3. Factors affecting improved knowledge and pro-environmental action

The best GLM model predicting increased environmental knowledge had gender, ‘closest to nature residence’ and profession as significant or near-significant predictors. To control the effects of the main residence, we included this 3-level variable as a random effects factor in the model. Although AIC increased negligibly (by 0.8), the significance of ‘closest to nature residence’ slightly increased and this predictor became significant. Thus, the GLMM model was preferred. The model (Table 5; “KNOW model”) suggests that respondents more likely increased their environmental knowledge if the respondent was female and not living on a farm (i.e. living in a village or town). The role of profession clearly suggested
that people with creative professions, namely arts and sciences, as well as farmers, were less likely to acquire new knowledge while all other professions did.

The best GLM model predicting pro-environmental behaviour had both respondent age and the number of events the respondent attended as positive linear predictors (Table 5; "BEHAV model"). Also, those respondents who reported increased environmental knowledge were more likely to be inspired for a new pro-environmental action. The effect of profession in this case was near-significant.

4. Discussion

4.1. Role of the arts and evaluation of the success of Nature Concert Hall

This study shows clear advantages of involving arts in biodiversity communication. The first advantage is the possibility to attract larger audiences. Involving arts helped to have a dialogue with a number of people that exceeded the number of participants in typical ‘science-only’ events by at least an order of magnitude. To the general public, artists are and will probably continue to be more well-known and recognized, and thus more of an attraction than conservation scientists. The second advantage, as one of the attributes of the arts is their ability to evoke emotions (Curtis et al., 2012), is a transfer of information through emotional channels creating affective attitude which sometimes can be a better predictor of pro-environmental action than cognitive attitude (Hungerford & Volk, 1990).

To discuss whether Nature Concert Hall was a successful campaign in terms of raising knowledge and increasing pro-environmental behaviours, we need to look at the Latvia-specific context of the public’s perception of nature conservation in the period before and during Nature Concert Hall. The belief that Latvia is a ‘green’ country and that Latvians love nature has been carefully nurtured and nurtured to society since the re-gaining of independence in 1991. Maybe it was indeed closer to truth in the beginning of the 1990s, but today we cannot agree with this. At the end of the Soviet period, people were more tolerant to nature conservation mainly because land did not formally belong to them (and they could not directly benefit from its exploitation) and this was also an opportunity to protest against the Soviet establishment (Pavars, 2013). But now in the 2010s the situation has changed. First, the state of wild species and habitats is at best bad and is apparently worsening due primarily to intensive forest exploitation and the intensification of agriculture (Anonymous, 2013; Vanwambeke, Meyfroidt, & Nikodemus, 2012). Second, Latvians seem to be among those nations of the European Union which are most reluctant to have nature conservation ideas (Eurobarometer, 2013). But Latvian responses to Eurobarometer questions on understanding nature were contradictory. In general terms, for example, to questions such as ‘Do you respect nature?’ or ‘Do you think that to halt biodiversity loss is a moral obligation?’, the response was very positive and did not differ much from the European average. But for more concrete actions, such as membership of environmental/nature NGOs, contribution to conservation projects and attitudes towards Natura 2000, Latvians are ranked among the countries with the lowest willingness to take such steps. The same was observed several years ago in the North Vidzeme Biosphere Reserve (Northern Latvia; Anonymous, 2007) when two enquiries reported that 64.5% and 77.0% of inhabitants considered nature conservation an important issue. In real life, however, these positive attitudes

<table>
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<th>Table 4</th>
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<td>Gender proportions (%) in different events and in reported change of knowledge and behaviour after Nature Concert Hall events.</td>
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<td>Latvian population census (2011)</td>
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<td>Other popular events without science&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>Nature Concert Hall</td>
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<td>Returned questionnaires about Nature Concert Hall</td>
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<td>Reported change after Nature Concert Hall</td>
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<td>Increased knowledge</td>
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<td>Increased pro-environmental behaviour</td>
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<sup>a</sup> We used 20 random photos from the internet which enabled gender count in audience of 3 popular annual events or festivals in Latvia, ‘Imantdienas’, ‘Positivus’ and ‘Labadaba’.

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<th>Table 5</th>
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<tr>
<td>Factors and covariates affecting improved environmental awareness and pro-environmental activity after the Nature Concert Hall events. Variables used in GLM models are described in Table 3.</td>
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<tr>
<td>Model parameter</td>
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<tr>
<td>Intercept</td>
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<tr>
<td>GENDER (male)</td>
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<td>LIVENAT (village)</td>
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<td>AGE</td>
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<td>Intercept variance (LIVEMAIN)</td>
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<sup>***</sup> p < 0.001.

<sup>**</sup> p < 0.01.

<sup>**</sup> p < 0.05.
often disappeared when a person faced restrictions in land use due to nature protection regulations, a typical NIMBY (not-in-my-backyard) phenomenon which in the nature conservation context generally means a resistance to specific conservation measures in or close to one's area of residence while exhibiting support to similar measures elsewhere (e.g. Petrova, 2013). At a national level, this phenomenon can be rooted in the fact that most Latvians think that the biodiversity loss problem (and therefore need for action) is more important for Europe and globally than for Latvia. The perception of the importance of biodiversity loss in one's own country in Latvia was much less than the European average (Eurobarometer, 2013).

Perhaps, the absence of general support to conservation is linked with understanding what 'green' and 'nature' actually are. Obviously to many people in Latvia, the perception of 'nature' is limited to a very productivist agrarian understanding, a self-constructed agrarian ethnoscpe (Schwartz, 2006) where there is little or no room for overall biological and landscape diversity. The land would perhaps still be considered 'green' by many people even when many bird songs are not heard in spring because all forests will be cut and natural grasslands disappear around their homes. The average Latvian seems to be seriously alienated, or is at great risk of becoming alienated, from nature. However, there have been times when, for example, birds were more important in lives of Latvian people. About 70% of over 250 single-word bird names in the Latvian language, representing 163 species, are used as homestead names from which most of Latvian family names originated (Strazds, Rātkevica, & Mardega, 2013). This clearly reflects a good knowledge of bird species in the past, but today the average Latvian would probably recognize no more than 10–20 of the most visible or charismatic bird species, unless of course she/he has been particularly interested in wildlife either professionally or on voluntary basis. We can only guess about the reasons for the change, but possibly a number of processes have contributed to this: a gradual loss of pagan wisdoms in favour of Christian rationalism and anthropocentrism, industrialization, replacement of Latvian inhabitants as a result of wars, Soviet collectivization and immigration–emigration processes.

All this means that nature conservation is low on today's political agenda at different levels and only the nature conservation obligations as a European Union Member State forced the government to introduce at least the minimum of required measures according to EU standards. Thus it is no surprise that in the first years of EU membership it was often heard that protected areas and nature conservation requirements are rather for bureaucracy at the European Commission in Brussels but not for the ordinary Latvian. Politicians and developers continue to complain that the whole of Latvia is a nature reserve and nature conservation is among the main obstacles to economic development, (e.g. Anonymous 2009, 2010, 2012) completely ignoring the fact that Latvia has the 3rd lowest cover of Natura 2000 network per national territory of all European Union countries (EEA, 2012).

Therefore at the time of developing the Nature Concert Hall concept, organizers had reasons to be worried about the responses of people both in terms of attendance and the effect. It was understood that neither government authorities nor environmental NGOs can successfully protect nature on their own and all stakeholders whose actions directly or indirectly affect nature should be involved (see also Rientjes, 2000). People's natural place attachment is known to warrant higher pro-environmental attitudes and behaviours (Halpenny, 2010; Scannell & Gifford, 2010). Therefore Nature Concert Hall, in addition to its 'scientific component' offered a wide variety of performances involving different art disciplines (see Section 2). Selected heroes (Table 1) had a particular role in raising natural place attachment. For example, chief-chaff Phylloscopus collybita is poorly known by Latvian people but is a very common bird species in Latvia, with a prominent and difficult-to-forget song which can be heard virtually everywhere in Latvia during the breeding season. Therefore, almost every participant, after being introduced to its song during the Nature Concert Hall, will surely hear chif–chaff in the days or months after, possibly around their homes, and thus will link this encounter with the poetry, music and conservation messages heard during Nature Concert Hall event.

In the above context and, unfortunately, in absence of results from similar studies, we think that the Nature Concert Hall outcome, namely 78.7% attendees reporting an increase in knowledge and 43.9% an increase in pro-environmental activity, can be considered as good, including the difference between the two measures, since we recognize the presence of different possible barriers that might stand between knowledge and an action. Moreover, the impact of Nature Concert Hall cannot be measured only in figures about increased knowledge and pro-environmental activity as it has a number of added values. For example, 60.1% of respondents stated that they did not come from afar just for the Nature Concert Hall event, but also visited places of interest and nature sites around the Nature Concert Hall location. This must have benefitted the local economy and most probably increased the value of biodiversity and nature in the eyes of local authorities. Secondly, many parents prohibit their children from exploring wild natural areas and subjects because parents have little familiarity with nature and have concerns about their children’s safety (Cheng & Monroe, 2012). But participating in wild nature activities (hiking, camping) and domestic nature activities (tending flowers and gardening) during childhood is related to pro-nature attitude and behaviour in adulthood (Wells & Lekies, 2006). It is important that the first encounter is positive. Although we do not possess exact statistics about children’s participation, it is clear that an important part of the Nature Concert Hall audience is families with children. Thus it may well be that for some ‘city kids’ the Nature Concert Hall event was the first and positive meeting with nature and wild species in a friendly atmosphere.

4.2. Predictors of increase of knowledge and pro-environmental behaviour

Significant predictors of the increase of knowledge and attitude were gender, profession and ‘closest to nature’ living location (Table 5, KNOW model). It was no surprise that women were more likely to attain new knowledge and improved environmental knowledge after Nature Concert Hall events. Environmental altruism in women was ranked higher than men (Arnocky & Stroink, 2011; Dietz, Kalof, & Stern, 2002) and women have stronger beliefs than men about consequences for self, others, and the biosphere (Stern et al., 1993). Most women are more emotional than men and probably the emotional language of Nature Concert Hall may have had a greater effect on women. Zelezný et al. (2000), however, found that the differences between men and women are stronger in behaviours than attitudes; this was opposite in our study as the effect of gender was significant only for increase of knowledge but not behaviour (Table 5). We also found that people with creative professions, namely arts and sciences, as well as farmers, were less likely to acquire new knowledge while all other professions did so. This could be due to the probability that a large proportion of creative people and farmers had higher ecological knowledge prior to Nature Concert Hall because they were in contact with nature in their professional lives to a greater extent than others, and thus they did not learn anything new. The variable ‘Closest to nature’ living location (LIVENAT) can be interpreted as the degree of exposure of the respondent to nature: if a person spends at least a part of the year on a farm, the connection with nature must be stronger than if a person lives in town. The significance of this variable could be explained in a similar way as the importance of profession; if a
person was in closer connection with nature before Nature Concert Hall, i.e. those having spent at least a part of the year on a farm (Table 5), she/he was less likely to learn something new.

Significant predictors of increased pro-environmental behaviour and an increase of knowledge, were age and the number of Nature Concert Hall events in which respondents participated, the effect of profession was near-significant (Table 5, “BEHAV model”). Although the relations between the knowledge and behaviour are not always clear (Kollmus & Aygemen, 2002), our study was in line with those studies which confirmed significant positive relationship (e.g. Cheng & Monroe, 2012; Stern & Dietz, 1994). Our finding that respondents were more likely to increase pro-environmental activity with age is seemingly against an initial ‘age hypothesis’ that younger persons are more concerned about the environment (Van Liere & Dunlap, 1980), however, these differences may have decreased by now (Fransson & Garling, 1999), and in our study actually this was related to the action, not knowledge and attitude. As regards to another significant predictor, the number of Nature Concert Hall events attended, we think that this factor may have increased the probability that a visitor will come across an interesting message that is relevant and can be implemented in his/her daily life.

To summarize, all statistically significant predictors of increase of knowledge were different from those affecting pro-environmental behaviour after Nature Concert Hall events. Only the variable ‘profession’ was present in both models, although it was only marginally significant in the “BEHAV model” (Table 5). This means that although an increase of knowledge was related to increase of pro-environmental behaviour in the “BEHAV model”, the relationship between knowledge and action is not as straightforward as it first seems. Different barriers between knowledge and attitude from one side and action from the other side may have had an effect. Among the barriers, we can name situational factors such as possession of property (where to act) and financial consequences that the action might require. From this perspective, age as a predictor of pro-environmental action seems logical, as economically active people are more likely to have a place and money for action than students and younger people. Some societal norms may have had an effect (e.g. Donald, Fielding, & Louis, 2014). For example, some people would not leave deadwood in their forest or extra floral items in their garden of no practical or aesthetic use, not because they do not know or do not agree that these features promote biodiversity, but because the neighbors (and/or relatives) will not understand them, as everything must be ‘kept in order’ which is a mark of ‘good management’ and being a good sainmnieks (a Latvian word for master) on own land (see also Schwartz, 2006).

4.3. Limitations of the study

A few limitations of this study should be discussed. First, it is still not clear if non-response biases have affected Nature Concert Hall success rates. We have no data to prove that men responded in smaller numbers because they are less communicatively, socially active or, on the contrary, are busier or simply lazy. Likewise we have no evidence that men did not reply because they are against nature conservation (a silent protest) or they think that nature conservation is an unimportant business, which they generally support, but not worth too much attention, thus leaving all responses to women on behalf of the whole family, although in the enquiry headings it was clearly emphasized that each individual (man, woman or child) should respond for him/herself.

The method of survey (web-based) might explain the prevalence of highly educated younger people as respondents in general, but the difference between gender ratios vary among studies (Kehoe & Pitkov, 1996; Palmquist & Stueve, 1996). Although more women use Facebook than men (a media that helped to reach at least a part of potential respondents), in our opinion, this cannot fully explain the large gender differences among the responses that we observed in this study. The prevalence of highly educated people in the audience may hint at some degree of elitism, i.e. that the format and contents of Nature Concert Hall events are only interesting and attractive to a limited audience—a local ‘intelligentsia’ with university educations, responsible and important posts and arriving by private vehicle (91% reported). If this is true, Nature Concert Hall needs to find ways to widen its audience, although there are some limitations: the number of participants in the last few seasons seems to have reached or even exceeded an upper limit of an outdoor concert carrying capacity (Table 2). A number of respondents from 2012 already complained about ‘too many people’, ‘loss of intimate atmosphere’ and ‘not being able to see all that happens on the stage because of crowding’.

4.4. Future of Nature Concert Hall and recommendations

Originally the format of Nature Concert Hall event was developed under a United Nations Development Programme (UNDP) project funded by the Global Environmental Facility (GEF). The final project evaluation assessed the Nature Concert Hall as a very effective public awareness raising tool, however, at the same time the evaluation felt that the long-term sustainability of the event might be threatened with a decreased amount of funding and an inability to uphold the integrity and free entrance principle of the event. However, despite the financial crisis in Latvia in 2008–2011, Nature Concert Hall has continued to have a positive response from sponsors, who were interested in financing the event without commercialization, as well as regular co-financing from the national government and local municipalities which actually increased year to year since the termination of UNDP support in 2009. Therefore we believe that the successful format of Nature Concert Hall will not change, at least in the near future, unless it will have to be adjusted to the increasing audiences and popularity.

There have been a few attempts to ‘internationalise’ Nature Concert Hall. The concept has been presented in an international UNESCO meeting in 2009, in the World Expo in Shanghai (2010); case studies on its success have been presented in several international meetings of European parliamentarians in Brussels (2011) and Baltic Sea state municipal leaders (2011). Finnish scientists participated in scientific part of the event in 2011, which was largely focused on the Baltic Sea. Also, as reported by questionnaire respondents, a lot of foreign guests visited Nature Concert Hall and expressed their ‘like’, mainly from other European countries, but also from as far away as Canada and Venezuela. However, attempts to stimulate the transfer of the concept to other countries for the most part seems to stumble upon the unique foundation upon which the Nature Concert Hall event was built. In Latvia, the event was demand-driven and from the ‘ground-up’, i.e. it grew from the interest of a musician to have new venues for inspiration and from a scientist who recognized that older forms of communicating nature protection ideas no longer produced the necessary impact on the wider public. Thus, the first constraint in the transfer to another country is that specific personalities, representing science and music need to be interested to talk to one another and need to recognize their ability and the mutual benefits of working together.

Apparently music and perhaps more technically advanced video performances are more of an ‘international language’ than solid, on-ground conservation science and mentality-bound poetry which have a more local character. It is unlikely that some of our most successful heroes, for example chiff-chaff Phylloscapos collybiuta, lichen Graphis scripta and seaweed Fucus vesiculosus, would be successful message transmitters elsewhere in the world, Europe or even in...
the Baltic Sea Region, mainly because of their distribution range, abundance and presence in cultural heritage. Thus we agree with Mosler and Martens (2008) that each campaign has to be tailored very specifically to local characteristics and it is difficult to derive a general format. Perhaps Nature Concert Hall’s format could be replicated in other countries, but not the contents of its ‘scientific element’ with its specific heroes. Nevertheless, we recommend that scientists and artists should collaborate, in spite of differences, and this can bring benefits in the end of the day. But those collaborations that already exist should be reflected wider because so far similar ongoing projects are poorly reported.

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