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Preliminary impressions of a citizen-scientist effort to monitor large carnivores in Lithuania

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Introduction

Four species of large carnivores (further LC) are currently found in Lithuania. Two of these, wolves (*Canis lupus*) and lynxes (*Felis lynx*) have permanent populations; whereas brown bears (*Ursus arctos*) are transient (but occasionally hibernate in country) and golden jackals (*Canis aureus*) only recently colonized Lithuania and other Baltic countries (MÄNNIL et al., 2014; STRATFORD, 2015). Conservation status of brown bears in the Lithuanian Red Data Book is category 0 (Ex) – extinct¹, lynx is category 1 (E) – endangered, wolves and golden jackals are game species with regulated harvest seasons.

In recent years, brown bear detections/observations have been infrequent, while lynx populations seem to be recovering, and wolf populations are increasing. As wolf populations increased,

the hunting season of wolves in Lithuania has changed considerably: 2000–2004 = 1 August – 1 April, 2005–2010 = 1 December – 1 April, 2011 = 15 October – 1 April, 2012 = 10 November – 1 April, 2013 – Present = 15 October – 1 April. The first harvest quota on wolves was established for the 2005/2006 hunting season. Wolf populations in Lithuania have generated considerable public interest; including formation of a non-governmental organization “Baltic Wolf” that initially suggested wolves were threatened with extirpation. This group subsequently influenced the wolf management plan that was adopted in 2012. In the plan, minimum-viable population size was estimated at 250 wolves, with suggested minimum and maximum populations of 100 and 400, respectively. Stakeholders, including hunters, were not considered during the setting of harvest quotas and they subsequently expressed concern that wolf populations were substantially underestimated from snow-based counts that estimated wolves at <300 and lynx at <100 individuals.

¹ not according IUCN categories; New Red data book is under preparation in 2017

In 2014, we considered how to involve hunters and other volunteers in an effort to monitor LC. Citizen science is sometimes referred to as public participation in scientific research and participatory-action research (see WELVAERT & CALLEY, 2016). Despite the non-technical approach, citizen-science projects are being used to monitor such features as climate change (GROULX et al., 2017) and regional patterns of biodiversity (HERZOG & FRANKLIN, 2016). Results of these projects are being used in decision making and managing of natural resources (VILLASEÑOR et al., 2016). We considered a citizen-science approach toward LC monitoring as an opportunity to incorporate the activities and knowledge of a major stakeholder (hunters) while obtaining information on the distribution and abundance of wolves, lynxes, and brown bears in Lithuania. Here, we provide an overview of the citizen-science project to monitor LC and initial results from December 2014 – March 2017.

Methods

We distributed a simple questionnaire to generate observation-based records of the carnivores (Table 1). Questionnaire was followed by explanation, aimed to help respondent to properly complete the questionnaire.

We accepted LC reports based on physical evidence that included carnivore carcasses, photo or video of an animal, tracks, scats, livestock or wild prey kills, and vocalizations (e.g., howls). Additionally, observation date/time, location (coordinates or map), and observer's identity and contact information were required. Anonymous reports were not accepted. All reports were received via e-mail or land post. Reports were evaluated and we contacted the observer for additional information when necessary. Other reports were rejected if they lacked cor-

roborating evidence. In the survey period, we did not receive fake photos or videos but did reject reports if the reported location was an area where existence of LC is improbable (i.e., in the middle of urbanized territory).

Much of the success of this project was the ability to widely promote it in the media, including publications for hunters, foresters, and amateur naturalists, plus radio, TV, and the internet, such as the website on Nature Research Centre (<http://www.gamtostyrimai.lt/lt/users/viewGroup/id.24/pageId.21>) and Lithuanian Hunters and Fishers Association (LHFA).

Results

From 14 December 2014 to 23 March 2017, we received 952 reports (758 on wolves, 180 on lynxes, 9 on brown bears, and 6 on golden jackals). These included reports that were supported by 913 photos and videos. Animals were seen in 283 cases, tracks in 534 cases, scats in 60 cases, killed livestock in 52 cases, killed wildlife prey in 14 cases, and other observations (howling heard, den or litter found) that were less numerous.

Number of observed wolves per report ranged from 1 (mostly footprints and scats) to 12 (direct observation of the pack that was also confirmed by a track count conducted by a different observer). The number of observed lynxes/report ranged from 1 to 5, some observations of 4 animals with photo and video evidence. Brown bear observations (animal and tracks only) were about single individuals. These observations suggested that bears were coming from neighbouring countries (Latvia and Belarus). With consistent reports of bears, their conservation status may change.

Reports fluctuated widely over time (Fig. 1), with largest numbers in winter (consequence of

Table 1 Questionnaire on large carnivores (wolf, lynx, brown bear) registration

Object of observation	
Time of observation	
Place of observation	
Respondent's data	
Comments	

tracks in snow) and summer as a result of live-stock depredation. One important observation was the apparent interaction respondent activity and presentation of information on the project on radio, TV, newspapers and popular internet portals. After such press releases, the number of reports rose.

We found group sizes of observed wolves and lynxes changed during 2015–2017 (Table 2). Proportion of single wolves observation diminished (2015–2016 $\chi^2 = 13.30$, $p = 0.0003$; 2015–2017 $\chi^2 = 12.43$, $p = 0.0004$). The same tendency was observed among lynxes, but was not statistically significant. Proportion of the groups that consisted of four or more wolves grew from 7.12 % in 2015 to 10.86 % in 2016 and 15.79 % in 2017 (2015–2016 $\chi^2 = 3.21$, $p = 0.07$; 2015–2017 $\chi^2 = 5.93$, $p = 0.02$). For lynxes, proportions of groups that consisted of three or

more animals grew from 5.55 % to 10.67 % and 17.65 %, respectively; however, these differences were not statistically significantly due to the small sample sizes (2015–2016 $\chi^2 = 1.05$, NS; 2015–2017 $\chi^2 = 2.44$, $p = 0.12$). Most notable was an observation of four lynxes in 2017 that was documented with 30 seconds of video.

Distribution of the number of LC reports was not even across the country (Fig. 2). Seven districts were apparently surveyed well enough to generate repetitive observations, thus enabling us to estimate the number of wolf groups and individuals, as well the number of lynxes and instances of breeding in those districts. However, coverage in districts with 11–30 reports was regarded as only sufficient. In 17 districts with 10 or fewer reports, there isn't enough information to estimate animal or group numbers. Among four districts, we obtained no reports.

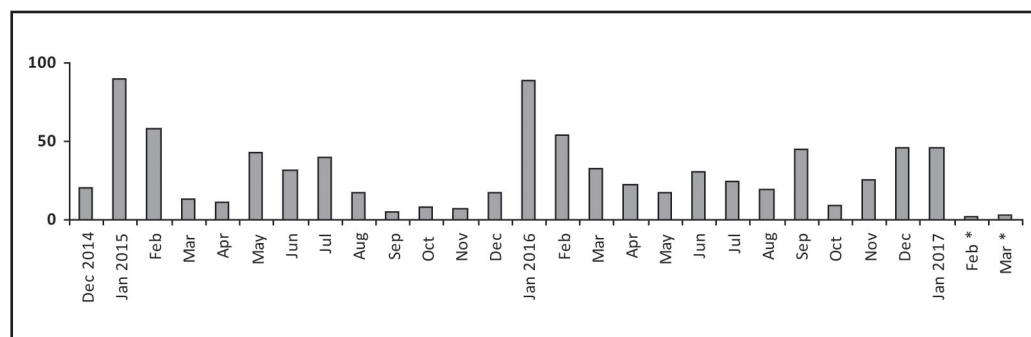


Figure 1 Temporal activity of the project respondents from December 2014 onwards.

* – part of data in 2017 not yet included.

Table 2 Changes in the reported group size of wolves and lynxes in January 2015 – March 2017 (per cent of observations)

Number of individuals in the group	Wolf			Lynx		
	2015	2016	2017	2015	2016	2017
1	68.66	55.80	47.37	83.34	77.33	70.59
2	17.10	21.26	23.68	11.11	12.00	11.76
3	7.12	12.08	13.16	3.70	8.00	11.76
4	1.71	4.83	9.21	1.85	1.33	5.89
5	1.14	3.38			1.34	
6	0.86	0.72	6.58			
7	3.13	0.97				
8		0.72				
12	0.28	0.24				

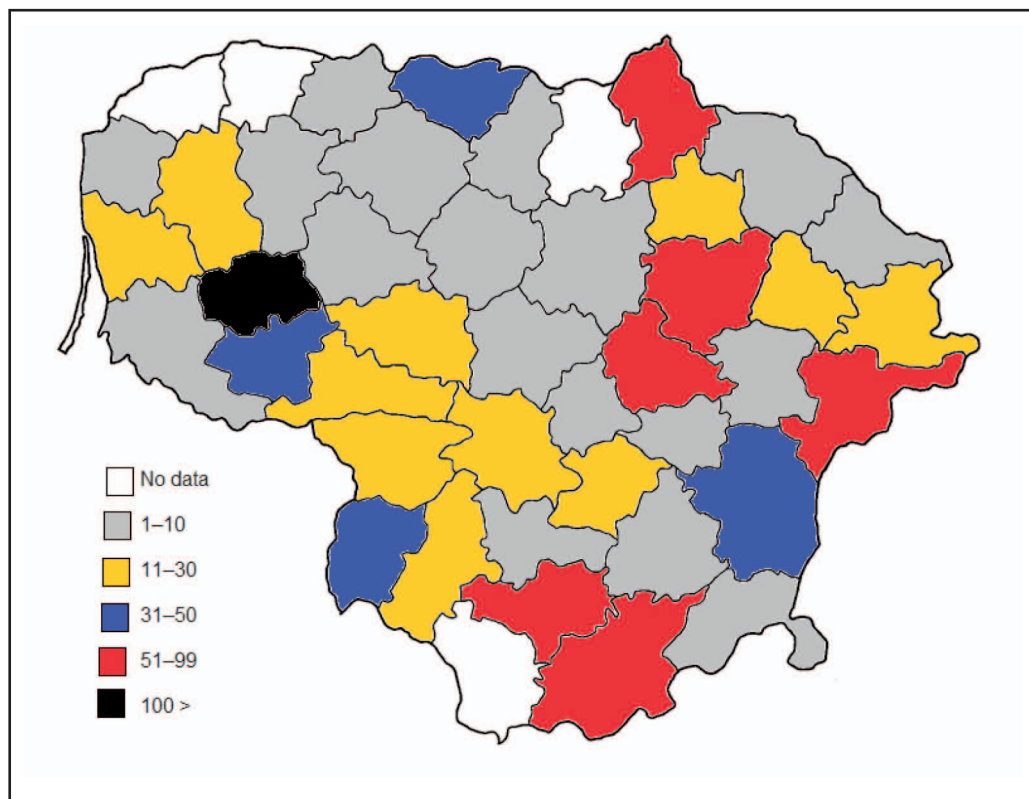


Figure 2 Distribution of the number of reports on large carnivores from administrative district of Lithuania in January 2015 – March 2017.

We cannot conclude that LC really absent in these areas because we do not know if any effort was made to record observations. Ecological conditions (e.g., land cover and prey populations) in most of these districts do not explain situations, as at least wolves were present here in the past years, and there were no reasons for them to die out or move. In the future, we should plan additional efforts to get participating observers in these districts.

Discussion

A major concern of our project is the reliability of respondents. Presence of LC in the territory of hunting grounds is considered as “sensitive” by many, if not most hunters. Presence of breeding lynxes may impose restrictions on hunting, depending of species status in the habitat directive. Thus, hunters may not want to disc-

lose lynx observations from formerly unknown territories. Despite this, the status of lynx populations in Lithuania seems to be improving. Using best examples (see RESNIK et al., 2015), we are working on ways to improve participation by informing hunters.

An additional concern is the confidentiality of data. Some of observation data refer to locations, where wildlife cameras are established. Even in the ongoing web-based representation of observations, exact locations of such places will be “washed” or “dimmed” to avoid revealing the exact locations of encounters.

Finally, there should be consensus among all participants on the goals of the project. No doubt, some of respondents consider the main goal as a way to represent their own position and potential influence setting of harvest quotas (especially for the wolf hunt). We understand that representativeness in citizen-science initiatives is a complex issue; however, it has been

used to establish conservation policies (LEVIN et al., 2015). In Lithuania, regrettably, citizen science has not yet been received as a credible source of information. This is disappointing given that snow counts of LC failed in two of the last three winters (<http://www.am.lt/VI/index.php#a/18069>). We believe our approach can provide information on LC distribution and the number of breeding groups. We stay on the position of participatory LC monitoring (see STADDON et al., 2015), and will continue citizen initiative, fully recognizing local understanding of hunters and other respondents, and representing their position in LC conservation in Lithuania and internationally.

Conclusions

1. Lithuania is a country with variable snow cover. Thus, conditions are not always suitable for the estimation of LC numbers via snow counts.
2. Methods used in the citizen-science project, carried out by Nature Research Centre and Lithuanian Hunters and Fishers Association (LHFA) proved to be suitable for the LC survey and are not dependent on snow cover.
3. Our project is the only source of LC status for the winters of 2015/2016 and 2016/2017, when official survey failed.
4. Our data suggest that the abundance of wolves and lynxes may have been underestimated.
5. In the last three years (2015–2017), abundance, distribution, and average group size of wolves and lynxes increased.
6. We now are working to increase hunter participation, as major stakeholders in carnivore population management. At a moment, this project has the largest data set on LC in Lithuania.

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