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Biogeosciences Discussions

Interactive comment on "Expansion of great cormorant colony immediately increased isotopic enrichment in small mammals" *by* Linas Balčiauskas et al.

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Dear Editor, dear anonymous Reviewer#2, please find answers to comments. In the name of all authors Linas Balčiauskas

Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-492-RC2, 2018 Answers to Interactive comment on "Expansion of great cormorant colony immediately increased isotopic enrichment in small mammals" by Linas Balčiauskas et al. Anonymous Referee #2

General comments: Comment: First of all I have to precise that I am not familiar with the topic of biogenic pollution but with the use of 13C and 15N isotopic methods for other fields in ecosystems. However, such as they are presented in the introduction, the aims of this study sound very close to those of the previous paper published by the same authors in 2016. Perhaps consistent with this comment, the sentence ending the introduction (L28) was probably necessary to really indicate the novelty of this paper and then, its original aim: evaluating the speed of impact of great cormorant colony on small mammals. The results presented here partially confirm/reinforce the first results published in 2016 on the impact of colony. However, I am not convinced by the methods (and a fortiori by the results) used for studying the speed of this impact, yet consisting in the main novel objective of this paper. This study emerged from a particular event where cormorant colony drastically and rapidly grew (2015) following several years of measures of limiting breeding success. I understand this consisted in an opportunity to test if colony expansion has rapid effect in this site. However it cannot help to quantify the speed of the effect but can only state if the effect can be rapid (1 year) or not, in this site.

Answer: this comment has much in common with the comment of Rev#1, thus, we dare to answer in short way for not to repeat it. Novelty of the presented manuscript is in evaluation of the immediacy of cormorant influence to mammals – such results, to our best knowledge, are presented for the first time. In fact, there is even not much published information on the small mammal ecology changes under influence of the Great Cormorant colony. Thus, even agreeing with the fact, that presented results reinforce already published tendencies (Balciauskas et al., 2016), we see sufficient input to the science and practice in the presented manuscript. Scientifically, it is first time that immediacy of the cormorant colony is confirmed, in practice these results show, that cormorant scarring may yield not expected results. Namely, terrestrial ecosystem in influenced in the new places as cormorants move their nests, and influence is immediate, in the same year. We suppose to add "in the same year" to the manuscript text. We also are going to add text to P10L26, explaining unwanted practical effect of

the cormorant scarring from the colony.

Comment: The design used does not allow statistical calculations (multiple sites) to generalize the effect of colony growth on isotopic signatures of small mammals. Moreover, Fig1 shows that the 3 zones (expansion, ecotone and colony) are partially confounded e.g. the ecotone zone is included in the colony zone - this point was unclear and very disturbing for me.

Answer: we fully agree with comment, that investigation was restricted to single site. Unfortunately, replication was not possible. The colony in JuodkrantÄŮ is unique in Lithuania, and its expansion was also unique event, never happened before. Moreover, territorial expansion was mainly into the former control area! Thus, we fortunately had data from the former control zone. However, number of rodents, trapped inside the zone, is finite (see Table 1 in the text). Trapping cannot be extended, as size of the colony is limited, density of the rodents, as we already stated in previous publications, is limited, and only two species have numbers, giving an opportunity to test differences between colony zones. We had no chances to choose expansion zone, as cormorants themselves settled in the previous control zone after scaring measures ceased. As for statistics, to show immediacy, we need to compare results from previous year, even if some of them are already known. Sample size could not be increased due to completely objective reason (size of the colony and limited number of rodents), thus, we did our best. Still we found, that in Apodemus flavicollis (Table 2) δ15N increased in ALL zones (increase in the ecotone zone, 7.5% is significant). Increase in the colony is $\sim$1%, expansion zone compared to former control – 5.7%, but all values are correlated with colony growth and expansion. It is easy to calculate, that ca. 40% bigger sample would have significant differences in all comparisons. As there are no other suspected factors, just number of birds (nest appearance) and their biological pollution, we found such increase worth to analyse. However, we have no data from other published sources for comparison – no such publications were found. Fig. 1 was already reworked, as shown in the answer to Rev#1. Ecotone is not in the colony itself

– it is between colony and unused forest, just unused forest is irregularly shaped and partially surrounded by colony. We expect that after changes it is clear to the reader.

Comment: Therefore, the scope of this study is strongly limited, not only regarding 1) the characterization of the speed of the effect (the main message) but also 2) its reliability to generalize the speed of colony effects in other sites. For these major reasons I mainly perceived this manuscript as a complement of the former paper (2016) rather than a novel paper addressing a research on the speed of the cormorant colony effects.

Answer: we agree that this study is limited in many aspects, including lack of repeated measurements; however, it is novel in the aspect of assessing immediacy of the influence of great cormorant colony to small mammals! We cannot agree with Reviewer#2 opinion about possible generalization, as there are no chances to test both (his and our) opinions. We may just hypothesize that publication of these results urge scientists of testing immediacy in other sites, if growth of the colony (including other colonial birds) will be available.

Comment: Introduction should better develop scientific implications and questions emerging from studying colony impact. What are the consequences in terms of scientific interests?

Answer: In the introduction we focused on small mammals, living in the Great cormorant colony. P3L10-14 show, that most of the biology of small mammals is affected. However, so far we investigated consequences of the long-term impact. We expect that showing immediacy of the impact of the colonial bird gives new insight into science of ecosystem change, explaining, that in extreme cases rapid changes may occur due to natural causes, such as increase of biological pollution. From the practical implication, results let us conclude, that management of the colonies of great cormorants may have unexpected outcome: if scared birds start to nest in the new areas, they affect it up to mammal level in the first year. In the protected areas with valuable habitats around

the colony such situation may be completely unacceptable. Instead, inhibiting of the growth of bird numbers by limiting breeding success may be preferred.

Comment: P3L18-24. This half-paragraph is focused on the approach. It should be shortened here and be developed more extensively in the material & methods section.

Answer: we follow suggestion of rev#2. Former text “Measures of limiting breeding success in JuodkrantÄŮ great cormorant colony were started in 2004 (Knyva, unpublished) and they withhold colony from expansion. In 2015 measures were not applied, resulting colony growth. First nests appeared in the area, which was free of cormorants in 2014, thus, was used as control zone in Balčiauskas et al., (2016). In 2015 we repeatedly examined δ13C and δ15N distribution in a great cormorant colony, this time including in plants and invertebrates as expected diet sources of small mammals.” was removed from Introduction, shortened, and incorporated after P4L10. After changes, text in P4L4-9 is: “In 2004 number of breeding pairs reached 2800. In the same year measures of limiting breeding success in JuodkrantÄŮ great cormorant colony were started (Knyva, unpublished) and they withhold colony from expansion. Over 3500 nests have been recorded in the colony each year since 2010, with the exception of 2014 when, due to control measures (firing petards in the nesting period), the number of successful pairs was under 2000. In 2015 measures were not applied, resulting colony growth. First nests appeared in the area, which was free of cormorants in 2014, thus, was used as control zone in Balčiauskas et al., (2016).”

P4L13: Replace It’s by Its Answer: corrected

P8L18: "Stable" is repeated twice, remove one Answer: corrected

P9L1-2: This sentence sounds redundant with previous paragraph. Maybe it could be included in previous paragraph. Answer: we follow suggestion of Rev#2, moving sentence to previous paragraph

Table2: horizontal alignment should be modified Answer: cells re-aligned top left

Please also note the supplement to this comment:
https://www.biogeosciences-discuss.net/bg-2017-492/bg-2017-492-AC2-supplement.pdf

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