

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

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bg-2017-492 Expansion of great cormorant colony immediately increased isotopic enrichment in small mammals Linas Balčiauskas, Raminta Skipitytė, Marius Jasiulionis, Laima Balčiauskienė, and Vidmantas Remeikis Handling Associate Editor: Sébastien Fontaine, sebastien.fontaine@clermont.inra.fr Status: Discussion (BG Discussions)

Anonymous Referee #1 However, I have some concerns about the design and the novelty of this study.

Comment: The first goal of this study as mentioned in Page 3 L 26 seems too obvious.

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It should be clear that the nutrient input increases as the number of great cormorants and the faecal deposit become greater in the new habitat. I suppose that the authors intended to mention that they aimed to show how rapidly nitrogen derived from the great cormorants were used by primary produces and the consumers at higher trophic levels.

Answer: We thank Anonymous Referee #1, and extend the Aim (P3, L24-25) with "immediacy". Now Aim is formulated as "The aim was to evaluate immediacy of the effects of the transfer of biogens from the aquatic to terrestrial ecosystem by an expanding great cormorant colony, i.e., how rapidly nitrogen derived from the great cormorants was used by primary produces and the consumers at higher trophic levels.". Such formulation corresponds to the Abstract as well.

Comment: Even if this were one of their goals, the presented data would seem not enough to achieve the goal. The data used for this purpose were the isotopic signatures of two species of small mammals at a single control site in 2014 and at the same site but inhabited by the great cormorants in 2015. I think that replicated study sites would be necessary to examine statistically the effects of colony expansion on the isotopic signatures of consumers.

Answer: Unfortunately, replication was not possible. The colony is unique in Lithuania, and expansion was also unique event. Moreover, territorial expansion was mainly into the former control area! Number of rodents, trapped inside the zone, is finite (see Table 1 in the text).

Comment: In addition, the statistical results (Table 2) showed that there was almost no significant difference in ^{15}N of the two small mammals between before-expansion (2014) and after-expansion (2015). It seems at least to me that the small mammals were not dependent on the cormorant-derived N, which is not consistent with the conclusion of this study (e.g., P2 L15). Please explain from which datasets the conclusion was drew. With the development of the great cormorant colony in 2015, the isotopic sig-

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natures, mostly $\delta^{15}\text{N}$, in dominant small mammal hair grew compared to 2014, though not all differences are significant (Table 2).

Answer: Significance of differences depends on the sample size. Sample size was limited by situation, and without possibilities to be increased. Thus, results of Table 2 are restricted and final. However, we cannot agree with two things in this comment: 1. cormorant-derived N is well known as biogen in the colony, affecting all trophic levels (Ishida, 1996; Kameda et al., 2006; Klimaszyk and Rzymiski, 2016; Nakamura et al., 2010) – references from this paper only. 20-30 references could be easily added to show nitrogen drastic increase in the colonies. 2. In *Apodemus flavicollis* (Table 2) $\delta^{15}\text{N}$ 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 are correlated with colony growth and expansion. 3. in *Myodes glareolus* $\delta^{15}\text{N}$ increased in the ecotone zone, 2.3%, and in the colony, $\sim 1\%$. Not significantly, but still this is increase, and no other factor, just colony growth, could be expected. 4. yes, there was no increase of $\delta^{15}\text{N}$ in *Myodes glareolus* in the expansion zone. Please have in mind, that in both years single individuals were processed, as no more of them were present. We may expand text in P6 L27-28 if required.

Comment: Regarding the second goal, the authors had already shown that the great cormorant colonies significantly affected the isotopic signatures of the small mammals in their previous study published in 2016. Therefore, although I recognize the importance of datasets of the basal food sources presented by this study, the goal and the obtained results seem highly confirmatory.

Answer: For our best knowledge, this investigation is the first one to show speed/immediacy of the impact. To show immediacy, we need to compare results, even if some of them are already known. If Editors will advice, more results may be placed as Supplement.

Minor comments: - P2 L2: “and” damage Answer: agree, will be changed

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- P2 L12: It was not surprising to me. It simply indicates that the plant used more cormorant-derived N than the invertebrates. Answer: Word “surprisingly” will be removed.

P3L14: It would be better to describe the background and the importance of this study based not on the authors’ group interest, but on the scientific interest. Answer: fully agree with the comment. Proposed change to the text is: instead of “Our continuing interest in the great cormorant colony in JuodkrantÄŰ was maintained by the fact that it’s area and number of breeding pairs increased in 2015 due to the absence of deterrent measures” will be changed to “However, area of the great cormorant colony in JuodkrantÄŰ and number of breeding pairs increased in 2015 due to the absence of deterrent measures”

P3L23: This sentence (gender and age) is not necessary here. Answer: will be removed

P5L2: If the authors think this information (Table 1) is necessary, please provide it as a supplementary file. Answer: If Editor is of the same opinion, we agree to remove.

P8L3: Which datasets showed the influences of great cormorants on small mammals? Please explain. Answer: there was no dataset presented, explanation in the text, P8 L6–10. Table with numbers of trapped individuals in 2014 and 2015 in different zones may be added as Supplement.

P8L24-P9L13: This subsection seems not directly related to the aims of this study. Answer: subsection was formulated to show, that various authors relate differences in stable isotope concentration to the diet. It arise after previous comments, to show that small mammal migrations had very limited influence, and to confirm, that isotopic differences reflect diet differences in the spatial zones of the cormorant colony.

P9L20: This sentence is unclear. Please clarify. Answer: Proposed change to the text is: instead of “So we support the opinion that cormorant influence is mediated

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through disturbance of food resources (Millus and Stapp, 2008).” will be changed to “So we support the opinion of Millus and Stapp, 2008, that cormorant influence to small mammals is not direct, but is mediated through influence onto their food resources.”

Fig.1: This figure seems a bit puzzling. The yellow line in Fig.1 (b) was explained as colony area, but the area included not only colony zone, but also ecotone zone. Please consider modifying the figure and legend. Answer: As we understand, most puzzling was legend, where “colony” was used for specific zone in the colony, and as “territory”. We changed legend, and also changed picture, to show exactly, to where the colony was expanded, and how ecotone zone was in the area. In the territory, two areas inside were not inhabited by cormorants (we made colour more intense, to show this), thus, ecotone was in the border of one of such areas. Proposed change to the text: P4L13 instead of “Zone of ecotone was situated between colony and forest to the south (Fig 1a).” we propose “Zone of ecotone (Fig 1a) was situated between colony and unused forest inside the inhabited territory, shown in darker green in Fig 1b.”

Also: Figure 1. Trapping design in the great cormorant inhabited territory in Juodkrantė (a) and colony expansion in 2015 (b). Trapping of small mammals performed in the expansion zone (1), ecotone (2) and the colony (3). Yellow line – great cormorant inhabited territory in 2014, red line – colony expansion in 2015.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-492/bg-2017-492-AC1-supplement.pdf>

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