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Corrigendum: Impacts of a non-indigenous ecosystem engineer, the American beaver (*Castor canadensis*), in a biodiversity hotspot

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A corrigendum on

Impacts of a non-indigenous ecosystem engineer, the American beaver *(Castor canadensis)*, in a biodiversity hotspot

by Richmond JQ, Swift CC, Wake TA, Brehme CS, Preston KL, Kus BE, Ervin EL, Tremor S, Matsuda T and Fisher RN *(2021) Front. Conserv. Sci. 2:752400.* doi: 10.3389/fcosc.2021.752400

In the published article there was an error in **Article Type**. It was incorrectly submitted as a Review; the correct **Article Type** is Perspective.

The published article did not contain a **Data Availability Statement**. The correct **Data Availability Statement** appears below:

"Data for the arroyo toad habitat occupancy analysis and R code for the Poisson generalized linear mixed effects model (GLM) and categorical regression analyses can be downloaded from the journal website."

In the published article, there were several errors in the **Supplementary Material**.

The original data for the arroyo toad habitat occupancy analyses was omitted. The missing material appears below:

"To further evaluate the relationship between the non-native species index (NNI) and beaver dam presence, we performed two sets of analyses using Bayesian multilevel models

in the R package brms (Bürkner 2017). First, we fit a Poisson generalized linear mixed effects model (GLM), which included a fixed intercept, fixed effect of beaver presence, and a random effect for year to account for repeated measures (Duarte et al., 2018). We evaluated model fit by ensuring that all model parameters had Gelman-Rubin values <1.1, by visually inspecting the posterior samples for convergence, and by generating posterior predictive plots to measure within-sample predictive performance. We specified default priors and ran the model across 4 chains for 2000 iterations, with a warmup of 1000 iterations, and a thinning rate of 1, totaling 4000 post-warmup samples. This model showed that the estimated NNI was nearly three times greater (mean = 2.9; 95%CI = 2.1–3.9) at sites where dams were present (mean = 1.9, 95%CI = 1.3–2.6) compared to sites where they were absent yet still contained water (mean = 0.7, 95%CI= 0.5–0.8).

We also performed a categorical regression treating NNI as a discrete state variable (Congdon 2005), with NNI modeled as a function of an intercept and beaver dam presence. We included year as a random effect, and specified default priors for the intercepts at each NNI level and the effect of beaver dams on NNI. We evaluated model fit and performed the analysis using the same run specifications as described above. Default priors used for these analyses are viewable in the model object after it is run in R. This analysis confirmed that a higher NNI score was more probable when a beaver dam was present (Figure 2B, main text).

The data used to perform the occupancy analysis (Supplemental Data.xlsx) and R code for running the Poisson GLM and categorical regression (Supplemental R code.pdf) are downloadable form the journal website.

Bürkner, P.-C. (2017). brms: An R package for Bayesian multilevel models using Stan. J. Stat. Softw. 80, 1–28.

Congdon, P. 2005. Bayesian models for categorical data. New York, NY: John Wiley & Sons, Ltd.

Duarte, A., Adams, M.J., and Peterson, J.T. (2018). Fitting N-mixture models to count data with unmodeled heterogeneity: Bias, diagnostics, and alternative approaches. Ecol. Model. 374, 51–59."

It was also discovered that (1) a beaver dam recorded in 2004 was inadvertently not included in the dataset, and that (2) removal of mosquitofish (*Gambusia affinis*) from the non-native index (NNI) in the 2013–2018 dataset (due to its ubiquity across the survey area) was not applied to the 2003–2012 dataset. This led to an NNI ranging from 0 to 3 in the 2013–2018 dataset and 0 to 4 in the 2003-2012 dataset.

To correct the discrepancy in the combined dataset and test for any effect on our conclusions in the published article, we removed mosquitofish from the NNI across all years and reran the occupancy models in PRESENCE, then re-analyzed the correlation between beaver dam presence and NNI using a Spearman rank test for averaged annual covariate values across sites.

There was a statement in **Supplementary Material**, *Arroyo toad field Surveys and data analysis*, paragraph three, that required clarification about the use of correlated variables. The corrected statement appears below:

"To reduce model complexity, we initially removed correlated variables by category (water, aquatic vegetation, etc.; Table S1) based on Pearson and Spearman rank tests (Bonferroni adjusted $p < 0.05$ and $r/\rho > 0.25$; Bonett and Wright 2000). If certain correlated variables were of particular interest (e.g., NNI score, specific non-native taxa, etc.), we tested them in separate models."

Lastly, there was labeling error in Supplementary Table S1 involving the covariate "Hydroperiod (current year & previous year)". It previously stated:

Hydroperiod (current year & previous year)	Hydroperiod (months wet) for water year (July-June)	n/a	Both

The clarification appears below:

Hydroperiod	Ephemeral, perennial	n/a	Both

In the published article, as a result of re-analysis of the arroyo toad occupancy data as described above, changes were required to Figure 2. The corrected Figure 2 and its caption appear below.

In the published article, as a result of re-analysis of the arroyo toad occupancy data, it was necessary to correct **Native Fauna and Flora Under Threat**, *Arroyo Toad*, paragraph one. The text previously stated:

"The presence of a beaver dam was also a significant predictor of extirpation, with the probability of local extinction being 2.5 (95% CI 0.9–3.4) times higher when a dam was present. The probability of extinction grew to nearly 0.70 when a beaver dam and all three non-native species were present, nearly seven times higher than in reaches without any invasive species (Figure 2)."

The corrected sentence appears below:

"(Figure 2A). Data averaged across years further showed that a non-native species index (NNI: the number of non-native aquatic species recorded at a site, ranging from 0-3 and consisting of American bullfrog, red swamp crayfish, and or large predatory fish [e.g., *Micropterus* sp., treated as a single species]) and beaver dam presence were significantly correlated (Spearman's $\rho = 0.62$, $P < 0.001$). The presence of a beaver dam also increased the probability of a higher NNI score, with the estimated NNI being nearly three times greater (mean = 2.9; 95% credible interval = 2.1-3.9) at sites where beaver dams were present versus sites where they were absent yet still contained water (See Supplemental File for further details). Thus, beaver dams were not only a top predictor of occupancy dynamics in the arroyo toad, their presence was also associated with increased richness of non-native aquatic predators."

In the published article, **Effects of novel ecological disturbance on native fauna and flora**, paragraph six. The reference for Anderson et al., 2009 was incorrectly written as Wright et al., 2006.

The authors apologize for these errors and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

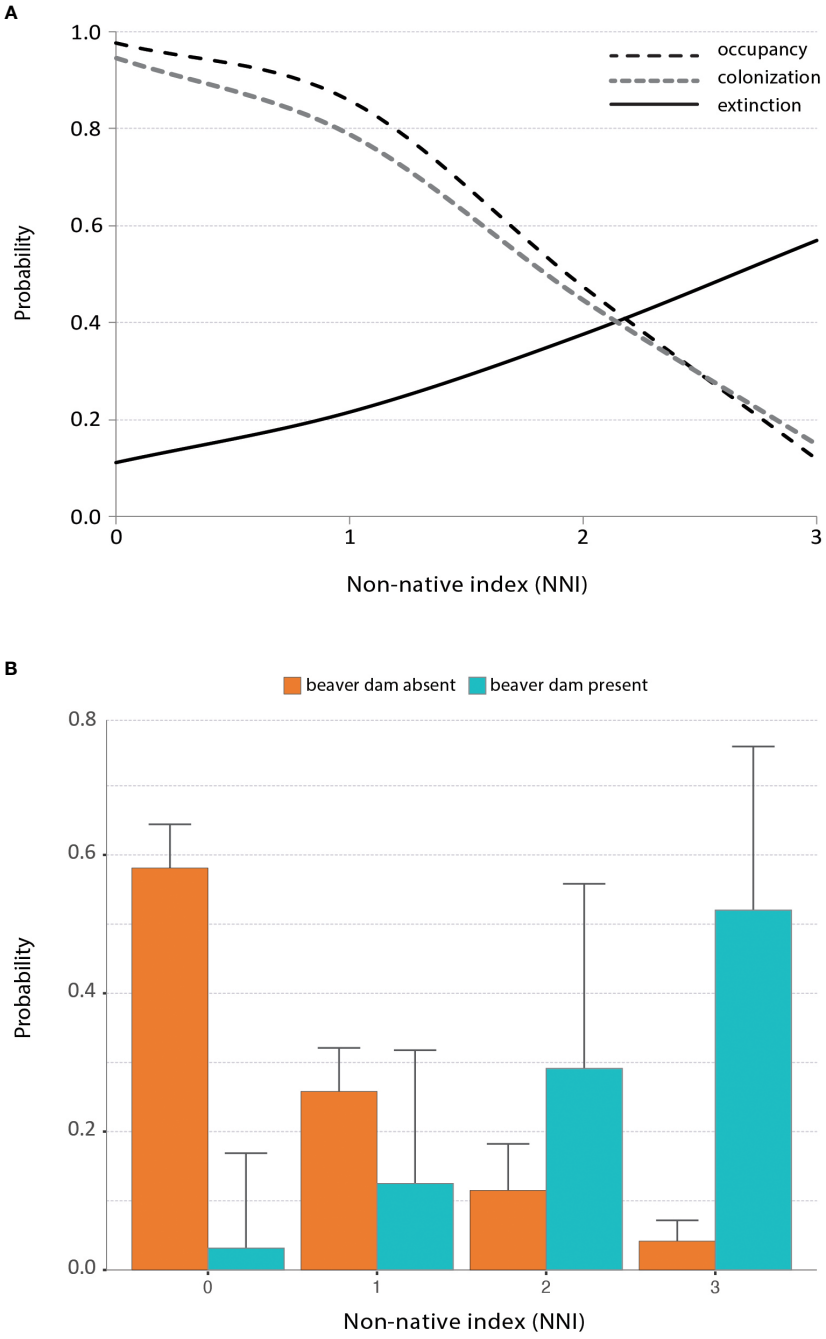

FIGURE 2
(A) Effect of the non-native aquatic species index (NNI: the number of non-native aquatic species observed at a site, ranging from 0-3 and consisting of American bullfrog, red swamp crayfish, and or large predatory fish [e.g., *Micropterus* sp., treated as a single species]) on the probability of occupancy, colonization, and local extinction of arroyo toad in coastal San Diego county from 2003–2018. **(B)** Results of the categorical regression showing the probability of the NNI score relative to beaver dam presence/absence (error bars represent the upper 95% credible intervals of the posterior probability distributions: see Supplemental File for further details).

Publisher's note