Short Paper

Anson Main[*,1], Elisabeth Webb[1]

[a]*Department, Street, City, State, Zip*

[b]*Department, Street, City, State, Zip*

Abstract

This is the abstract.

It consists of two paragraphs.

Methods

All analysis were carried away with the R Statistical Software (R Core Team 2016), all meta-analyses were made on the metafor package (Viechtbauer 2010). Our estimations were based on the use of random/mixed-effects models form of meta-analyses, which provide an unconditional inference about a larger set of studies from which the k studies included in the meta-analysis are assumed to be a random sample (L. V. Hedges and Vevea 1998). This estimations do not assume that this larger set consists only of studies that have actually been conducted, but instead envision a hypothetical population of studies that comprises studies that have been conducted, that could have been conducted, or that may be conducted in the future (L. V. Hedges and Vevea 1998).

We used the *escalc* function of the metafor package to estimate the effect size estimates (Viechtbauer 2010), we used the *standardized mean difference with heteroscedastic population variances in the two groups* (SDMH) as our estimator for effect size (Bonett 2009), the metafor package also corrects the slight positive bias of the estimation following (Wasserman, Hedges, and Olkin 1988). To be extra conservative we used the unbiased estimates of the sampling variances. In all cases the residual heterogeneity estimator was Hedges.

Since we used mixed effect models we used the The Knapp and Hartung adjustment **(Knapp and Hartung, 2003)** to test the individual coefficients of the model.

Test for (Residual) Heterogeneity

For each model we tested for residual heterogeneity, if we used models without moderators, then the Cochran's Q-test (Cochran 1954) was used to test whether the variability in the observed effect sizes or outcomes is larger than would be expected based on sampling variability alone. *A significant test suggests that the true effects or outcomes are heterogeneous.* When moderators were included in the models the Q__E-test for residual heterogeneity was used, this tests whether the variability in the observed effect sizes or outcomes not accounted for by the moderators included in the model is larger than would be expected based on sampling variability alone. When using moderators to explain more variability a pseudo R squared was computed following (Raudenbush 2009).

Results

As we can see in figure 1, the most common type of performance measured in studies was abundance, with 101 estimations, followed by reproduction with 44 estimation, behavior with 23, and finally survival and condition with 16 each.

*Corresponding Author

Email addresses: `maina@missouri.edu` (Anson Main), `webbli@missouri.edu` (Elisabeth Webb)

Table 1: effect size of the Standardized mean difference for each type of estimation of performance, it's standard error and p-value

estimate	ci.ub	ci.lb	group	p	n	I2	pvalCT
-0.966	-0.470	-1.462	Abundance	0.000	102	90.702	0
-2.232	3.012	-7.476	Behavior	0.404	29	99.895	0
-8.131	-2.544	-13.718	Survival	0.004	28	99.667	0
0.203	14.647	-14.240	Reproduction	0.978	90	99.997	0
-1.903	-0.892	-2.915	Condition	0.000	40	99.247	0

Overall effect size

As we can see in table 1 and figure 2, all estimations of the effects are negative. However, only abundance, survival and condition have significative negative effects. Survival has the highest effect size, with a mean difference estimation of -8.13

Estimations using moderators:

Abundance

Comparison of models

Table 2: Comparison of models taking into account p value, Pseudo R squared and AICc

model	p_value	R_squared	AICc	deltaAICc	Weight
y ~ Concentration [g/kg]	0.515	0.00	96.674	0.000	0.582
y ~ Concentration [g/kg] + Nesting Area	0.494	0.00	98.593	1.918	0.223
y ~ Concentration [g/kg] + Functional group	0.719	0.00	99.544	2.869	0.139
y ~ Concentration [g/kg] + Nesting Area + Functional Group	0.570	0.00	101.324	4.650	0.057
y ~ Concentration [Kg/Ha]	0.717	0.00	200.388	103.714	0.000
y ~ Concentration [kg/ha] + Nesting Area + Functional Group	0.299	0.10	205.140	108.466	0.000
y ~ 1	0.000	0.00	470.711	374.037	0.000
y ~ Nesting Area	0.208	0.02	471.590	374.916	0.000
y ~ Functional group	0.168	0.04	472.548	375.874	0.000
y ~ Order + Functional group	0.029	0.16	478.057	381.382	0.000

Behaviour

Comparison of models

Table 3: Comparison of models taking into account p value, Pseudo R squared and AICc

model	p_value	R_squared	AICc	deltaAICc	Weight
y ~ Concentration [ppb]	0.107	0.05	142.911	0.000	0.54
y ~ Concentration + neonic type	0.090	0.15	143.231	0.320	0.46
y ~ study type	0.450	0.00	241.727	98.816	0.00
y ~ neonic type	0.525	0.00	241.913	99.002	0.00

model	p_value	R_squared	AICc	deltaAICc	Weight
y ~ Treatment type	0.831	0.00	244.788	101.878	0.00
y ~ Treatment type + Functional group	0.874	0.00	250.281	107.370	0.00

Reproduction

Comparison of models

Table 4: Comparison of models taking into account p value, Pseudo R squared and AICc

model	p_value	R_squared	AICc	deltaAICc	Weight
y ~ Concentration [ppb] + Neonic type	0.000	0.27	313.155	0.000	1
y ~ Concentration [ppb]	0.237	0.00	329.737	16.582	0
y ~ Order + Functional group	0.381	0.14	978.523	665.369	0
y ~ Order + Nesting Area	0.821	0.00	983.156	670.001	0

References

Bonett, Douglas G. 2009. "Meta-Analytic Interval Estimation for Standardized and Unstandardized Mean Differences." *Psychological Methods* 14 (3). American Psychological Association: 225.

Cochran, William G. 1954. "The Combination of Estimates from Different Experiments." *Biometrics* 10 (1). JSTOR: 101–29.

Hedges, Larry V, and Jack L Vevea. 1998. "Fixed-and Random-Effects Models in Meta-Analysis." *Psychological Methods* 3 (4). American Psychological Association: 486.

R Core Team. 2016. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Raudenbush, Stephen W. 2009. "Analyzing Effect Sizes: Random-Effects Models." *The Handbook of Research Synthesis and Meta-Analysis* 2: 295–316.

Viechtbauer, Wolfgang. 2010. "Conducting Meta-Analyses in R with the metafor Package." *Journal of Statistical Software* 36 (3): 1–48. http://www.jstatsoft.org/v36/i03/.

Wasserman, Stanley, Larry V. Hedges, and Ingram Olkin. 1988. "Statistical Methods for Meta-Analysis." *Journal of Educational Statistics* 13 (1). JSTOR: 75. doi:10.2307/1164953.

List of Figures

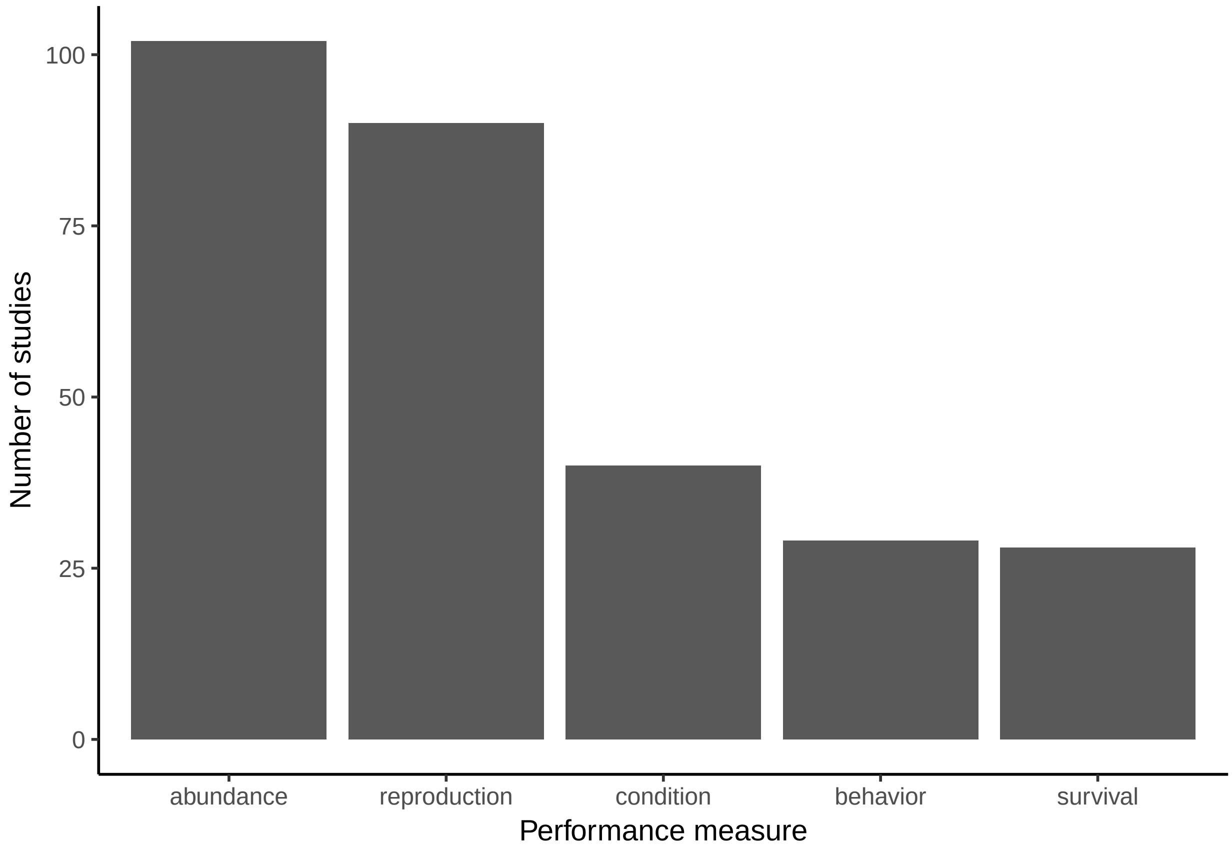

Figure 1: Number of estimation of effect size within the meta-analyses

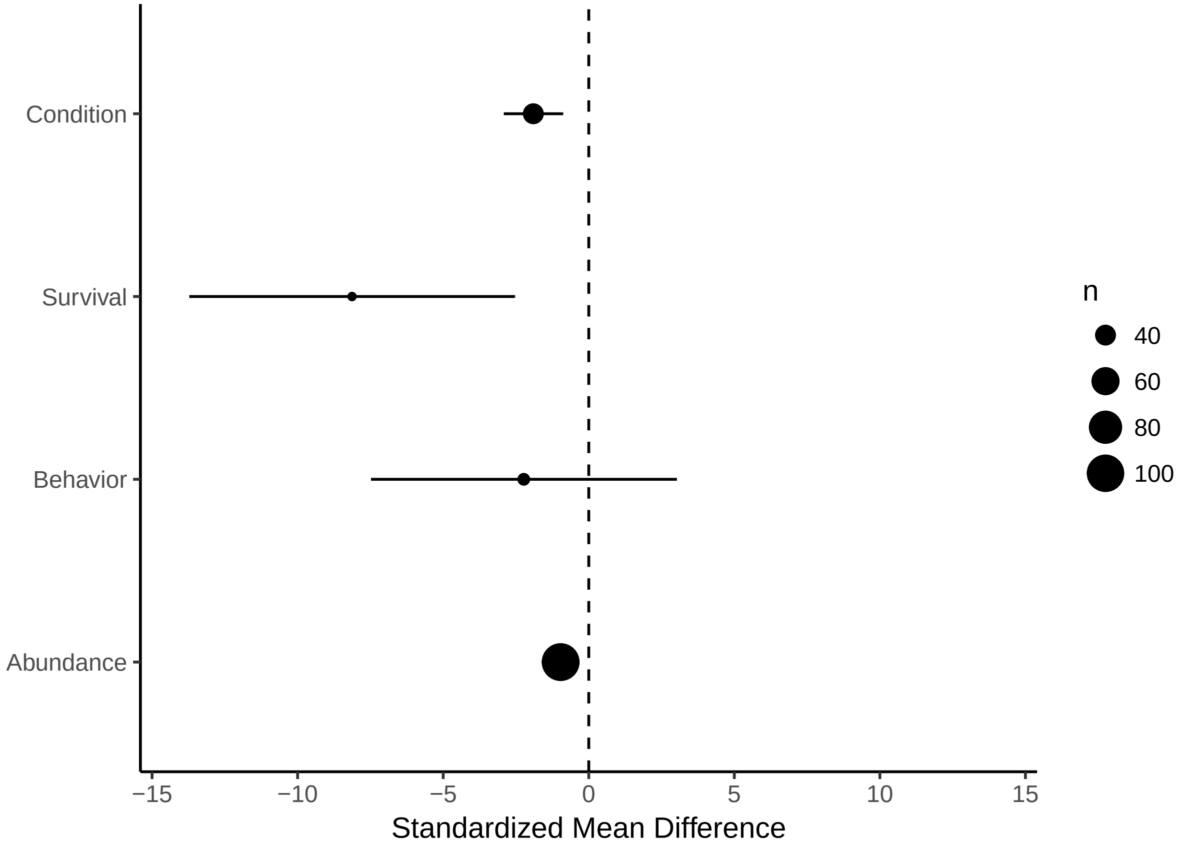

Figure 2: effect size of the Standardized mean difference for each type of estimation of performance and it's standard error

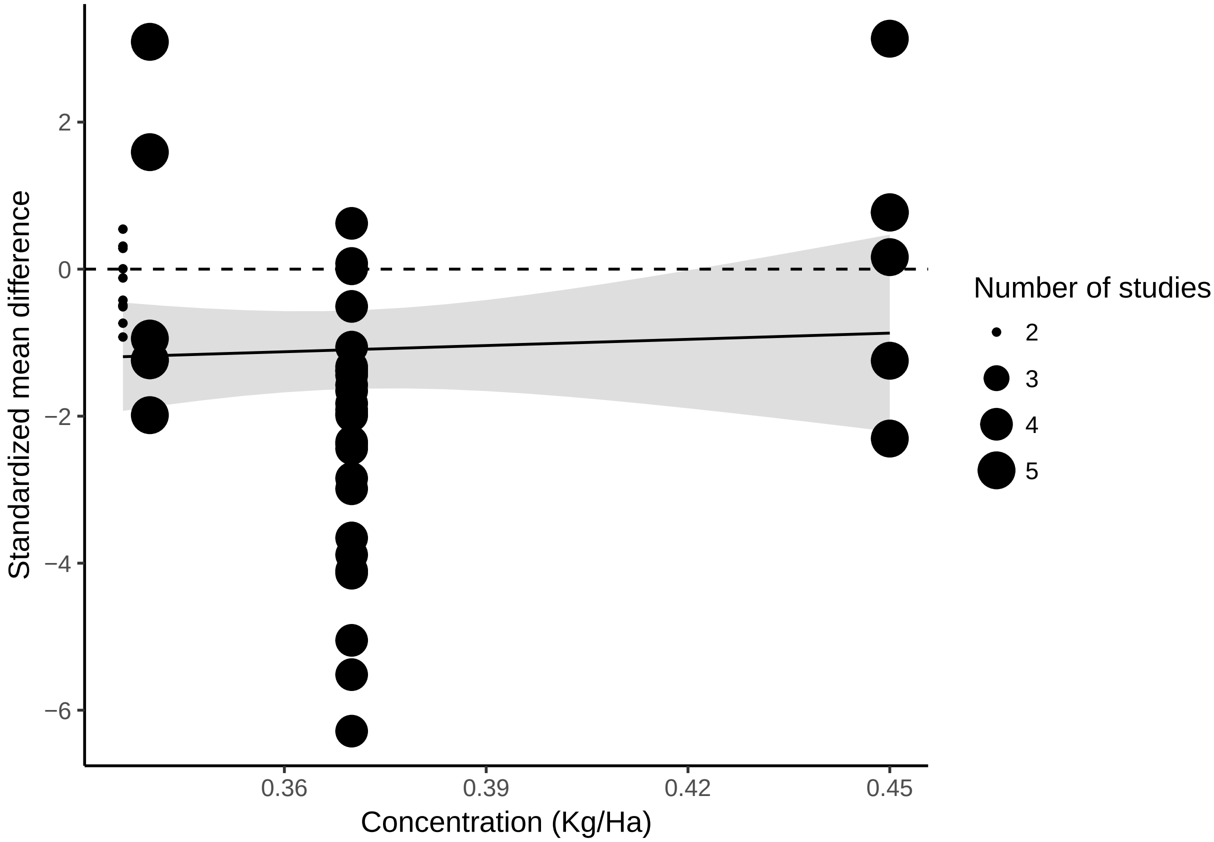

Figure 3: effect size of the Standardized mean difference of behavior and concentration (Kg/Ha) for powder/granular aplications

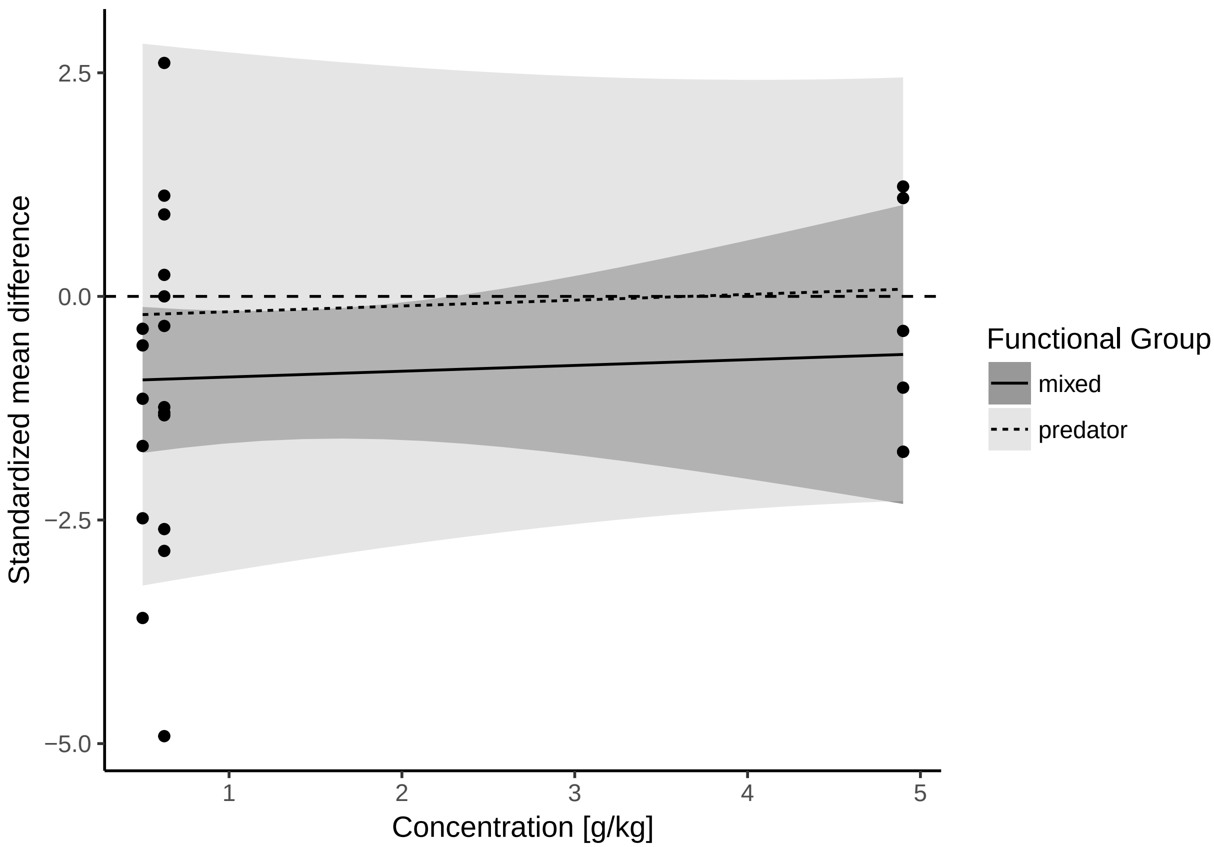

Figure 4: effect size of the Standardized mean difference of Abundance and concentration [g/Kg]

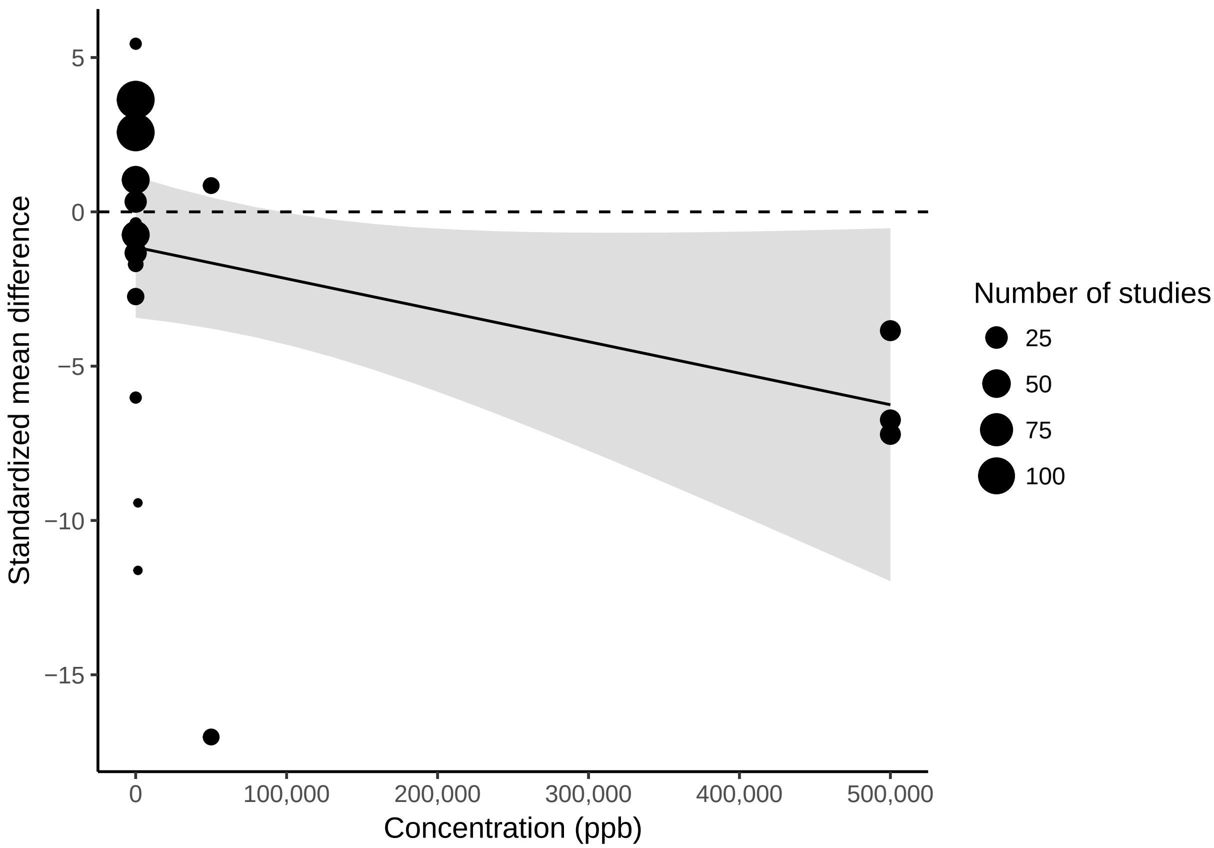

Figure 5: effect size of the Standardized mean difference of behavior and concentration (ppb)

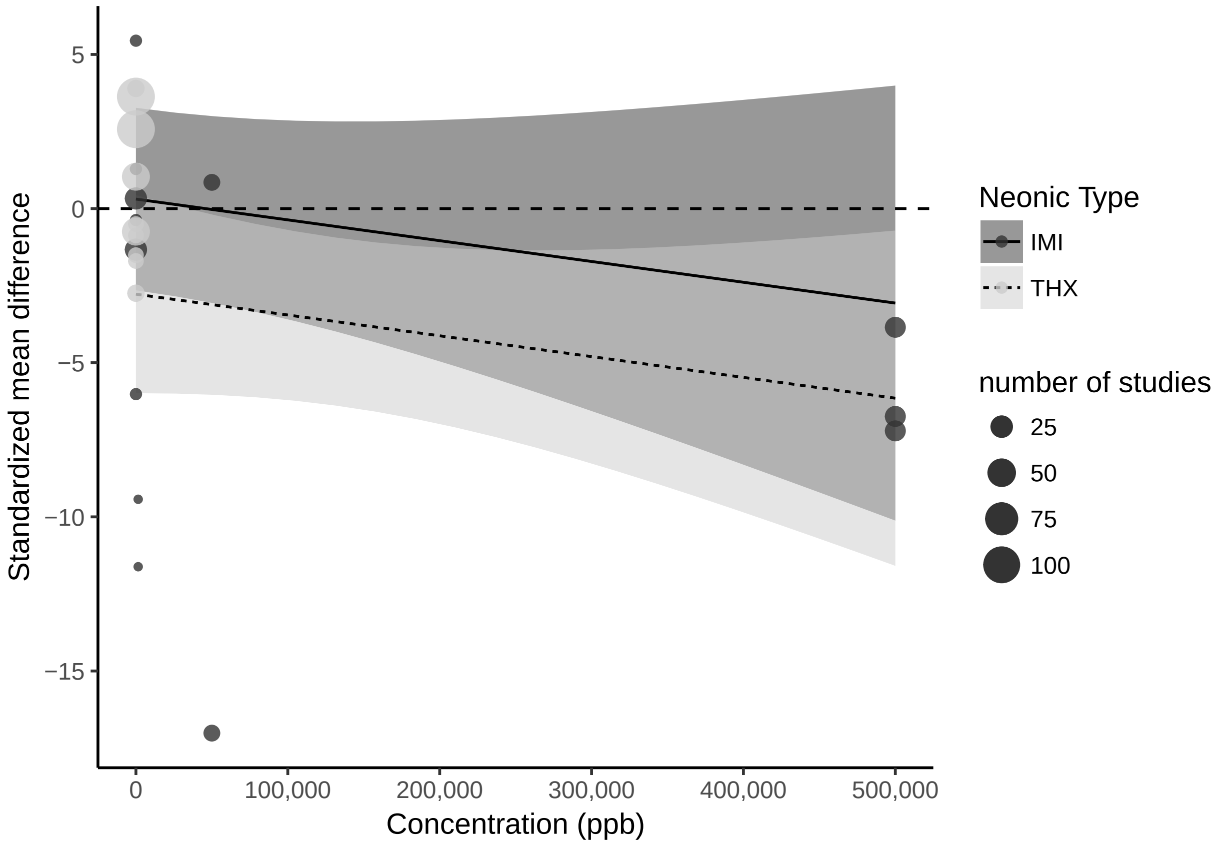

Figure 6: effect size of the concentration and neonic type on the behavior Standardized mean difference of abundance

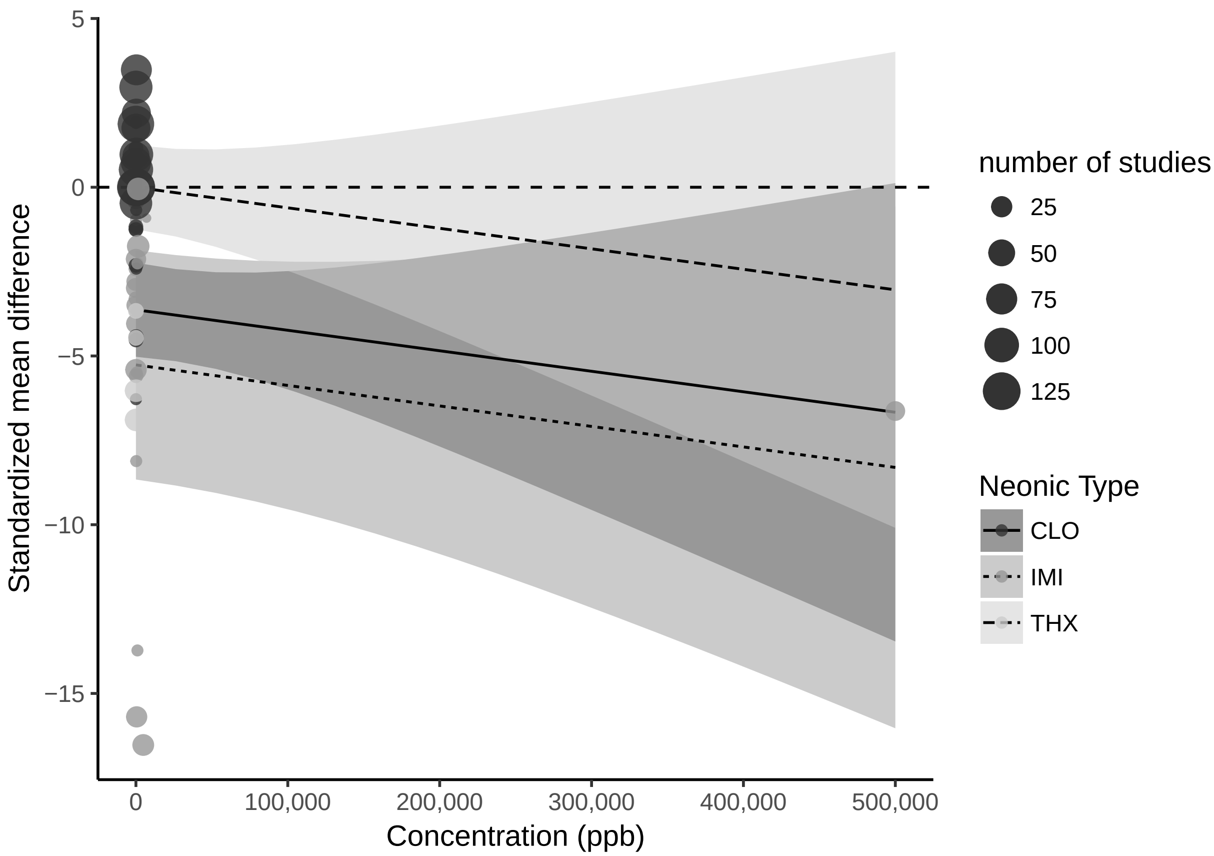

Figure 7: effect size of the concentration and neonic type on the reporoduction Standardized mean difference of abundance