

CORRECTION

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Correction to: Risk-based management framework for microplastics in aquatic ecosystems

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The authors of this study discovered two mathematical errors in the alignment of toxicity data to the ecologically relevant metrics (ERMs), volume and surface area. The mathematical process was accurately described in the supplemental information of the original publication. The errors were only present in the source code for the Toxicity of Microplastics Explorer (ToMEx) used to perform the calculations [4]. In addition, the corrected analysis also excludes data from a study used in the previous analysis due to failure to meet the predefined technical red criteria for inclusion of control data [1]. The exclusion of this study has a minor impact on final threshold values and confidence intervals relative to mathematical errors.

Estimation of particle volume correction.

In the original publication, particle volume was incorrectly calculated for fragments, and the generic equation for the volume of a cylinder ($V = \pi r^2 h$) was

used to estimate the volume of fibers, assuming a diameter of 15 μm - unless the length was otherwise reported (Kooi et al., 2019). The corrected analysis now applies the following equation to estimate particle volume for all morphologies where a , b , and c are equivalent to one-half times the particle length, width, and height: $\mu_{v,mono} = V_i = \frac{4}{3}\pi abc$. The application of this equation is accurately described in the supplementary information in the original Mehinto et al., [3] manuscript (equation S8). If the width is unknown, the average length to width ratio for the selected environmental compartment is used to estimate width [2]. If height is unknown, the height to width ratio was assumed to be 0.67 [2].

Estimation of particle surface area correction.

Particle surface area was incorrectly calculated for all morphologies. Specifically, particle length (a), width (b), and height (c) were not multiplied by one-half before the application of the surface area equation, which is accurately described in supplementary information of the original Mehinto et al., [3] manuscript (equation S9):

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Table 1 Comparison of threshold values for food dilution, where data are aligned according to particle volume, before and after corrections were made

Threshold	particles/L (95% CI)		mg/L (95% CI)	
	Previous	Corrected	Previous	Corrected
#1 Investigative Monitoring	0.3 ^a	0.2 ^a	0.05 ^a	0.04 ^a
#2 Discharge Monitoring	3 (0.3–66)	2 (0.2–123)	0.4 (0.05–11.05)	0.4 (0.04–20.04)
#3 Management Planning	5 (0.4–219)	3 (0.3–261)	0.9 (0.07–36.07)	0.6 (0.05–43.05)
#4 Source Control	34 (3–859)	23 (19–1,150)	6 (0.4–141)	4 (0.3–188)

^a Threshold 1 is the lower 95% CI of the HCS calculated for Threshold 2, therefore confidence intervals cannot be reported for this threshold

Table 2 Comparison of threshold values for tissue translocation, where data are aligned according to particle surface area, before and after corrections were made

Threshold	particles/L (95% CI)		mg/L (95% CI)	
	Previous	Corrected	Previous	Corrected
#1 Investigative Monitoring	60 ^a	83 ^a	10 ^a	14 ^a
#2 Discharge Monitoring	312 (57–4,680)	377 (83–5,960)	51 (10–770)	62 (14–981)
#3 Management Planning	890 (118–19,000)	721 (188–6,950)	146 (19–3,120)	119 (31–1,140)
#4 Source Control	4,110 (493–69,100)	2,340 (598–20,900)	676 (81–11,400)	384 (98–3,440)

^a Threshold 1 is the lower 95% CI of the HCS calculated for Threshold 2, therefore confidence intervals cannot be reported for this threshold

$$\mu_{sa,mono} = SA = 4\pi \left(\frac{(ab)^{1.6} + (ac)^{1.6} + (bc)^{1.6}}{3} \right)^{1/1.6}$$

Estimation of maximum ingestible size.

A unit conversion was being misapplied when estimating the maximum ingestible particle length according to the allometric equation provided in Jåms, et al. 2020. (Nature). Specifically, instead of the body length (reported in cm) being multiplied by 10 in the model (i.e., maximum ingestible size [mm] = $10^{(0.9341 * \log_{10}(\text{body length [cm]} * 10) - 1.1200)}$); the order of operations was incorrect: (i.e., maximum ingestible size [mm] = $10^{(0.9341 * \log_{10}(\text{body length [cm]} - 1.1200) * 10)}$).

Effect on calculated threshold values.

Corrections to the threshold values for food dilution resulted in changes no more than 9 particles or 2 mg per liter at most (Table 1). The largest change in threshold values was for Threshold #4, Source Control. All the corrected threshold values were also well within the original confidence intervals, which remain wide.

Corrections to the threshold values for tissue translocation had a greater impact than food dilution (Table 2). Values for Thresholds 1 and 2 were roughly the same as previously published values. Threshold 1 increased by 23 particles per liter or 4 mg per liter. Threshold 2 increased by 65 particles per liter or 11 mg per liter. Threshold 3 values decreased by 169 particles per liter or 27 mg per liter (~19% decrease). Threshold 4 values also decreased, though more substantially by 1,770 particles per liter or 292 mg per liter (~40% decrease). However, all corrected values fell within the previously published confidence intervals. Most confidence intervals narrowed following the correction, though they remained wide.

Though there were errors in the data analysis for calculating thresholds, the explanations provided in the supplemental information of the original publication remain correct and consistent with the proposed analytical process. While these corrections change the originally reported threshold values, confidence intervals remain wide, and the conclusions are the same. The management framework and analytical process for threshold derivation remain the same. The underlying data, with the exception of the one study excluded here, remain the same. Thus, the expert assessment assigning high confidence in the management framework and analytical process but low confidence in the thresholds themselves remains applicable.

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