Supporting Information

Solving the non-alignment of methods and approaches used in microplastic research in order to consistently characterize risk

Albert A. Koelmans*,[#], Paula Redondo-Hasselerharm[#], Nur Hazimah Mohamed Nor[#], Merel Kooi[#]

[#]Aquatic Ecology and Water Quality Management Group, Wageningen University, P.O. Box 47, 6700 DD, Wageningen.

* Corresponding author: bart.koelmans@wur.nl

10 pages

2 figures

2 tables

Detailed explanation and example calculation for $EC_{X,Poly}$ and the effect concentration for environmental microplastic $EC_{X,Env}$.

Imagine that a threshold effect concentration of $EC_{X,Mono}$ = 100 #/L is reported, for monodisperse spherical microplastic particles of 0.1 mm. This means that the equivalent volume in a litre is $100 \times 4/3 \times \pi \times 0.05^3 = 0.0524$ mm^3. This is the left hand side term in Eq 5. In the next step we calculate the number of particles that would produce the same volume, when these particles have the sizes drawn randomly from a microplastic size distribution limited by the bioavailable (i.e. ingestible) size boundaries set for a certain species, using a Monte Carlo simulation.

For instance, for a species that ingests particles with a width between 0.05 and 2 mm, we keep track of the number of particles ($k_{ingestible}$) that fit within this size window during the ($n = 10^5$) iterations during Monte Carlo simulation, and calculate their individual ellipsoid volumes (Eq. 3), by random sampling from L:H and L:W distributions (Figure 1). During the same iterations, masses for each of these imaginary particles are calculated, by multiplying the calculated volumes with individual particle densities sampled from a density distribution function. Total ingestible volume (V_T) is calculated by addition ($V_T = \sum_{i=1}^{i=\mathrm{k}} V_{Poly,i}$) and the average volume per particle (V_{Poly}, from the polydisperse distribution) is then calculated using Eq 6. Now, $EC_{X,Poly}$ can be calculated using Eq. 7.

During the Monte Carlo simulation, calculating the fraction of bioavailable particles is needed. This is done by dividing the number of bioavailable particles, by the total number of iterations (e.g. $n = 10^5$). Part of this bioavailability relates to ingestibility, i.e. whether the particle size fits the ingestible range per individual species (Table S1). However, besides correcting for particles to big to be ingested by a species, corrections for unavailability due to density can also be performed. For instance, for pelagic species, it is possible to only take that part of the microplastic continuum into account that has a density equal or smaller than 1 g/cm^3. For benthic species that live in or on the sediment layer, the full density distribution can be taken into account if data suggest this is the case. If for instance, due to these two criteria of ingestibility and density, k=250 000 particles defined during the Monte Carlo simulation would be considered bioavailable, then the fraction of bioavailable particles, $f_{available}$, would be $k/n = 250\,000/10^6 = 0.25$. The final effect threshold concentration for 'polydisperse environmental MP' ($EC_{X,Env}$) then is calculated as $EC_{X,Poly}/f_{available}$ (Eq. 8).

Table S1 : Ingestible size ranges.

Species	**Group**	**Animal size (mm)**	**Ingestible MP size[a] (µm)**	**Motivation**	**References[b]**
Daphnia magna	Zooplankton	5	114.87	Relationship based on maximum size of species: y =22x + 4.87, where y is diameter of largest bead (µm) and x is the carapace length (mm).	Burns, 1986[1]; Gouin, 2020[2]
Daphnia pulex	Zooplankton	3	70.87		
Ceriodaphnia dubia	Zooplankton	1.4	35.67		
Hyalella azteca	Benthic invertebrate	7.8	112	Based on anatomy (size of the mouth opening)	Schmitz et al, 1983[3]
Hydra attenuata	Benthic invertebrate	10 – 30	400	An MP size class of <400 mm was chosen as the freshly hatched *A. salina* nauplii that are fed to the *H. attenuata* are <400 mm in size.	Murphy and Quinn, 2018[4]
Danio rerio	Fish	25	400	General ingestible size given for adult zebrafish, by 3 literature sources.	Avdesh et al., 2012[5]; Naceur et al., 2008[6]; Harper and Lawrence, 2008.[7]
Artemia franciscana	Zooplankton	0.9	270	MP ingestion demonstrated up to 264 µm.	Jemec et al., 2018[8]
Gammarus fossarum	Benthic invertebrate	8.5	125	MP in the size range 63–125 µm showed significantly higher ingestion than other particle size treatments. MP of size range 125–250 µm were not ingested.	Straub et al., 2017[9]

[a] Literature research was performed in order to demonstrate ingestibility and to find plausible ingestible size ranges for the species used in the SSD (Figure 3). Ingestion was demonstrated for all heterotrophic species used in the effect studies (Table S2), except for *Daphnia pulex* and *Ceriodaphnia dubia* where this was based on studies that specifically addressed ingestion as reviewed by Gouin (2020). In all cases it was assumed that there would be no lower size limit with respect to what can be ingested. Therefore the minimum size limit was always set at 1 µm, being the low boundary for the 1 – 5000 µm microplastic size continuum. To assess an upper boundary, we considered reported sizes of ingested plastic particles but also of other particles or prey items, and then selected the largest value reported. For autotrophic species used in the SSD that do not feed on particles (e.g., phytoplankton, macrophytes) it was generally assumed that effects relate to the bulk of the material in its totality, e.g. due to reduction of light penetration, nutrient availability and/or general affects due to adherence of the bulk material to the exterior of the organism.

[b] **Table S1 References**

1. Burns, C. W. The relationship between body size of filter-feeding Cladocera and the maximum size of particle ingested. *Limnology and Oceanography*, **1968**, 13(4), 675-678

2. Gouin, T. Towards improved understanding of the ingestion and trophic transfer of microplastic particles - Critical review and implications for future research. *Environ Toxicol Chem*., **2020**, https://doi.org/10.1002/etc.4718
3. Schmitz, E.H; Scherrey, P.M. Digestive anatomy of Halella azteca (Crustacea, Amphipoda), J. Morphology, **1983**, 175, 91-100. https://doi.org/10.1002/jmor.1051750109.
4. Murphy, F.; Quinn, B. The Effects of Microplastic on Freshwater Hydra Attenuata Feeding, Morphology & Reproduction. *Environ. Pollut*. **2018**, 234, 487–494.
5. Avdesh, A.; Chen, M.; Martin-Iverson, M.T.; Mondal, A.; Ong, D.; Rainey-Smith, S.; Taddei, K.; Lardelli, M.; Groth, D.M.; Verdile, G.; et al. Regular Care and Maintenance of a Zebrafish (Danio Rerio) Laboratory: An Introduction*. J. Vis. Exp*. **2012**, No. 69.
6. Naceur, H. B.; Jenhani, A.B.R.; El Cafsi, M.; Romdhane, M.S. Determination of Biological Characteristics of Artemia Salina (Crustacea: Anostraca) Population from Sabkhet Sijoumi (NE Tunisia). *Transitional Waters Bull.* **2008**, 2 (3), 65–74.
7. Harper, C.; Lawrence, C. The Laboratory Zebrafish; CRC Press (Taylor & Francis Group), **2010**.
8. Jemec, A.; Kunej, U.; Skalar, T. Screening Study of Four Environmentally Relevant Microplastic Pollutants: Uptake and Effects on Daphnia Magna and Artemia Franciscana. *Chemosphere* **2018**, 208, 522–529.
9. Straub, S.; Hirsch, P.E.; Burkhardt-Holm, P. Biodegradable and petroleum-based microplastics do not differ in their ingestion and excretion but in their biological effects in a freshwater invertebrate Gammarus fossarum. *Int. J. Environ. Res. Public Health* **2017**, doi:10.3390/ijerph14070774

Table S2. Original and rescaled effect threshold concentrations as used in Figure 3A and 3B, respectively.

Reference	**Species**	**ET_reported**[1] (#/L)	**Size**[2] (µm)	**V_mp**[3] (µm^3)	**Ingestible**[4] (µm)	**Density**[5] g/cm3	**CSF**[6] (-)	**# fraction available**[7]	**M fraction available**[8]	**V_total**[9]	**$EC_{X,Poly}$**[10]	**$EC_{X,Env}$**[11]
Kokalj, 2018[1]	*A.franciscana*	624	183.1	1235512	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	9.47E+03	9.60E+03
Kokalj, 2018[1]	*A.franciscana*	5255.5	102.9	219294.7	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	1.42E+04	1.44E+04
Kokalj, 2018[1]	*A.franciscana*	18802	63.05	50447.22	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	1.17E+04	1.18E+04
Kokalj, 2018[1]	*A.franciscana*	392.2	264	3703342	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	1.78E+04	1.81E+04
Kokalj, 2018[1]	*A.franciscana*	473.7	247.9	3066278	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	1.78E+04	1.81E+04
Kokalj, 2018[1]	*A.franciscana*	1355.5	136.8	515276.4	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	8.58E+03	8.70E+03
Kokalj, 2018[1]	*A.franciscana*	253335.2	22.8	14301.96	270	full	0.01 - 1	0.986	7.32E-03	8.03E+09	4.45E+04	4.51E+04
Ziajahromi, 2017[2]	*C. dubia*	1950	2.5	8.181231	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	2.50E+01	2.66E+01
Ziajahromi, 2017[2]	*C. dubia*	135	2.5	8.181231	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	1.73E+00	1.84E+00
Ziajahromi, 2017[2]	*C. dubia*	275	280	197920.3	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	8.53E+04	9.09E+04
Ziajahromi, 2017[2]	*C. dubia*	120	280	197920.3	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	3.72E+04	3.96E+04
Jaikumar, 2019[3]	*C. dubia*	5000	3	14.13717	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	1.11E+02	1.18E+02
Jaikumar, 2019[3]	*C. dubia*	5000	5.5	33.48652	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	2.63E+02	2.79E+02
Jaikumar, 2018[4]	*C. dubia*	1258925	3	14.13717	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	2.79E+04	2.97E+04
Jaikumar, 2018[4]	*C. dubia*	31622.78	3	14.13717	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	7.01E+02	7.46E+02
Jaikumar, 2018[4]	*C. dubia*	1E+10	5.5	33.48652	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	5.25E+08	5.59E+08
Jaikumar, 2018[4]	*C. dubia*	6309573	5.5	33.48652	35.67	full	0.01 - 1	0.939	5.44E-05	5.99E+07	3.31E+05	3.53E+05
Wu, 2019[5]	*C. pyrenoidosa*	73440.08	157	2026271	5000	full	0.01 - 1	1	1	1.09E+12	1.36E+04	1.36E+04
Wu, 2019[5]	*C. pyrenoidosa*	33997.5	172	2664305	5000	full	0.01 - 1	1	1	1.09E+12	8.27E+03	8.27E+03
Mao, 2018[6]	*C. pyrenoidosa*	9.1E+12	1	0.523599	5000	full	0.01 - 1	1	1	1.09E+12	4.35E+05	4.35E+05
Lei, 2018[7]	*Danio rerio*	2930	70	69036.08	400	full	0.01 - 1	0.990	1.71E-02	1.88E+10	1.06E+03	1.07E+03
Ogonowski, 2016[8]	*D. magna*	28000000	4.1	36.08695	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	9.84E+04	1.01E+05
Ogonowski, 2016[8]	*D. magna*	8600000	2.6	3.537546	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	2.96E+03	3.05E+03
Ogonowski, 2016[8]	*D. magna*	50000000	2.6	3.537546	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	1.72E+04	1.77E+04
Rehse, 2016[9]	*D. magna*	1.14E+09	1	0.523599	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	5.82E+04	5.98E+04
Jaikumar, 2019[3]	*D. magna*	50000	5.5	33.48652	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	1.63E+02	1.68E+02
Jaikumar, 2019[3]	*D. magna*	50000	3	14.13717	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	6.89E+01	7.08E+01
Jaikumar, 2018[4]	*D. magna*	1E+11	3	14.13717	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	1.38E+08	1.42E+08
Jaikumar, 2018[4]	*D. magna*	6309573	3	14.13717	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	8.69E+03	8.93E+03
Jaikumar, 2018[4]	*D. magna*	1E+11	5.5	33.48652	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	3.26E+08	3.35E+08
Jaikumar, 2018[4]	*D. magna*	6309573	5.5	33.48652	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	2.06E+04	2.12E+04
Gerdes, 2019[10]	*D. magna*	16129352	5	25.15892	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	3.95E+04	4.06E+04
Jemec, 2016[11]	*D. magna*	3320	300	23561.94	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	7.62E+03	7.83E+03
Aljaibachi, 2018[12]	*D. magna*	159537.5	2	4.18879	114.87	full	0.01 - 1	0.973	9.02E-04	9.99E+08	6.51E+01	6.69E+01
Jaikumar, 2019[3]	*D. pulex*	50000	5.5	33.48652	70.87	full	0.01 - 1	0.962	2.89E-04	3.21E+08	5.01E+02	5.21E+02

Jaikumar, 2019[3]	*D. pulex*	50000	3	14.13717	70.87	full	0.01 - 1	0.962	2.89E-04	3.21E+08	2.12E+02	2.20E+02
Jaikumar, 2018[4]	*D. pulex*	1E+16	3	14.13717	70.87	full	0.01 - 1	0.962	2.89E-04	3.21E+08	4.23E+13	4.40E+13
Jaikumar, 2018[4]	*D. pulex*	5011872	3	14.13717	70.87	full	0.01 - 1	0.962	2.89E-04	3.21E+08	2.12E+04	2.20E+04
Jaikumar, 2018[4]	*D. pulex*	2E+10	5.5	33.48652	70.87	full	0.01 - 1	0.962	2.89E-04	3.21E+08	2.00E+08	2.08E+08
Jaikumar, 2018[4]	*D. pulex*	79432.82	5.5	33.48652	70.87	full	0.01 - 1	0.962	2.89E-04	3.21E+08	7.96E+02	8.28E+02
Straub, 2017[13]	*G. fossarum*	16666.5	47.5	21570.63	125	full	0.01 - 1	0.974	1.08E-03	1.20E+09	2.92E+04	3.00E+04
Straub, 2017[13]	*G. fossarum*	166665	47.5	21570.63	125	full	0.01 - 1	0.974	1.08E-03	1.20E+09	2.92E+05	3.00E+05
Au, 2015[14]	*H. azteca*	460000	18.5	3315.231	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	1.60E+05	1.64E+05
Au, 2015[14]	*H. azteca*	500000	18.5	3315.231	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	1.73E+05	1.78E+05
Au, 2015[14]	*H. azteca*	2500000	18.5	3315.231	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	8.67E+05	8.92E+05
Au, 2015[14]	*H. azteca*	2500000	18.5	3315.231	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	8.67E+05	8.92E+05
Au, 2015[14]	*H. azteca*	710	47.5	14922.57	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	1.11E+03	1.14E+03
Au, 2015[14]	*H. azteca*	2250	47.5	14922.57	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	3.51E+03	3.61E+03
Au, 2015[14]	*H. azteca*	2250	47.5	14922.57	112	full	0.01 - 1	0.972	8.39E-04	9.30E+08	3.51E+03	3.61E+03
Murphy, 2018[15]	*H. attenuata*	2642775	200	1610171	400	full	0.01 - 1	0.990	1.71E-02	1.88E+10	2.24E+07	2.26E+07
Kalčíková, 2017[16]	*Lemna minor*	4265	71.3	72954.25	5000	full	0.01 - 1	1	1	1.09E+12	2.84E+01	2.84E+01
Kalčíková, 2017[16]	*Lemna minor*	3125	96	178072	5000	full	0.01 - 1	1	1	1.09E+12	5.08E+01	5.08E+01
Wu, 2019[5]	*M. flos-aquae*	146880.2	157	1013136	5000	full	0.01 - 1	1	1	1.09E+12	1.36E+04	1.36E+04
Wu, 2019[5]	*M. flos-aquae*	67995	172	1332153	5000	full	0.01 - 1	1	1	1.09E+12	8.27E+03	8.27E+03

Column heading footnotes:

[1] Effect threshold concentration as reported, where necessary recalculated into #/L.

[2] Size selected for the correction. In case of a single size, that size was used. In case of a range while no actual distribution data were provided, the average was used. In case width – length data were provided, the longest dimension was used.

[3] Volume per particle.

[4] Assumption on ingestible size range for the species under consideration, based on the motivation above. For emergent macrophytes and for phytoplankton, no correction for ingestible microplastic was used. Only studies that confirmed ingestion were used. As for effects of a food dilution mechanism (based on ref 17): 78% of the 49 ingestion-related datapoints underlying the SSDs were from studies that explicitly cited food dilution, 4% were from studies that did not report any effect mechanism at all, however used the same species as for which food dilution was cited, bringing the total to 82%. For another 14% also no effect mechanism was reported, however it concerned other yet similar benthic invertebrate species than in the two previous categories. In this case, we just followed de Ruijter et al (2020)[17] who demonstrated based on a

review of 105 studies that food dilution was the dominant explanatory mechanism for effects, which brings the percentage of datapoints with food dilution as plausible effect (while no other mechanism is reported) to 96%. For the remaining 4% of data points (2 datapoints), one study speculated that 'physical effects upon ingestion' caused the observed effect, a mechanism which however also is related to ingestion and ingested volume. The final datapoint (out of 49), reported a biomarker response as effect mechanism. Besides these 49 ingestion-related datapoints underlying the SSD there were 7 datapoints that did not depend on food dilution as they related to algae ad macrophytes.

[5] In the present implementation, for all species, the full microplastic density continuum was considered bioavailable (indicated with 'full').

[6] Corey Shape Factor (CSF). All shapes having a CSF between 0.01 and 1 were considered to be of relevance for all species considered.

[7] Number fraction of the 10^5 imaginary MP particles randomly drawn using Monte Carlo simulations that fell within the specified ingestible size, shape and density range and or density range ($f_{available}$).

[8] Mass fraction of the 10^5 imaginary MP particles randomly drawn using Monte Carlo simulations that fell within the specified ingestible size, shape and density range and or density range ($f_{available}$).

[9] Total volume of the fraction of the 10^5 imaginary microplastic particles randomly drawn using Monte Carlo simulations that fell within the specified bioavailable size, shape and density range (V_{Poly} , Equation 6).

[10] Effect threshold concentration for polydisperse microplastic defined by the microplastic probability density functions, such that the total volume of the bioavailable polydisperse microplastic equates to the total volume of microplastic at the original effect threshold concentration ($EC_{X,Poly}$, Eq. 7).

[11] Effect threshold concentration for polydisperse environmental microplastic $EC_{X,Env}$, calculated as $EC_{X,Poly}$ divided by $f_{available}$ (Eq. 8).

Table S2 References

1. Kokalj, A.J.; Kunej, U.; Skalar, T. Screening study of four environmentally relevant microplastic pollutants: Uptake and effects on Daphnia magna and Artemia franciscana. *Chemosphere*, **2018**, doi:10.1016/j.chemosphere.2018.05.172

2. Ziajahromi, S.; Kumar, A.; Neale, P.A.; Leusch, F.D.L. Impact of Microplastic Beads and Fibers on Waterflea (Ceriodaphnia dubia) Survival, Growth, and Reproduction: Implications of Single and Mixture Exposures. *Environ. Sci. Technol*. **2017**, doi:10.1021/acs.est.7b03574

3. Jaikumar, G.; Brun, N.R.; Vijver, M.G.; Bosker, T. Reproductive toxicity of primary and secondary microplastics to three cladocerans during chronic exposure. *Environ. Pollut*. **2019**. doi:10.1016/j.envpol.2019.03.085

4. Jaikumar, G.; Baas, J.; Brun, N.R.; Vijver, M.G.; Bosker, T. Acute sensitivity of three Cladoceran species to different types of microplastics in combination with thermal stress. *Environ. Pollut*. **2018**. doi:10.1016/j.envpol.2018.04.069

5. Wu, Y. et al. Effect of microplastics exposure on the photosynthesis system of freshwater algae. *J. Hazard. Matter*. **2019**. doi:10.1016/j.jhazmat.2019.04.039

6. Mao, Y. et al. Phytoplankton response to polystyrene microplastics: Perspective from an entire growth period. *Chemosphere,* **2018**. doi:10.1016/j.chemosphere.2018.05.170

7. Lei, L. et al. Microplastic particles cause intestinal damage and other adverse effects in zebrafish Danio rerio and nematode Caenorhabditis elegans. *Sci. Total Environ*. **2018**. doi:10.1016/j.scitotenv.2017.11.103

8. Ogonowski, M.; Schür, C.; Jarsén, Å.; Gorokhova, E. The effects of natural and anthropogenic microparticles on individual fitness in daphnia magna. *PLoS One*, **2016**. doi:10.1371/journal.pone.0155063

9. Rehse, S.; Kloas, W.; Zarfl, C. Short-term exposure with high concentrations of pristine microplastic particles leads to immobilisation of Daphnia magna. *Chemosphere*, **2016**, doi:10.1016/j.chemosphere.2016.02.133

10. Gerdes, Z.; Hermann, M.; Ogonowski, M.; Gorokhova, E. A novel method for assessing microplastic effect in suspension through mixing test and reference materials. *Sci. Rep*., **2019**, 9, 10695.

11. Jemec, A.; Horvat, P.; Kunej, U.; Bele, M.; Kržan, A. Uptake and effects of microplastic textile fibers on freshwater crustacean Daphnia magna. *Environ. Pollut*. **2016**. doi:10.1016/j.envpol.2016.10.037

12. Aljaibachi, R.; Callaghan, A. Impact of polystyrene microplastics on Daphnia magna mortality and reproduction in relation to food availability. *PeerJ*, **2018**. doi:10.7717/peerj.4601

13. Straub, S.; Hirsch, P. E.; Burkhardt-Holm, P. Biodegradable and petroleum-based microplastics do not differ in their ingestion and excretion but in their biological effects in a freshwater invertebrate Gammarus fossarum. *Int. J. Environ. Res. Public Health*, **2017**, doi:10.3390/ijerph14070774

14. Au, S.Y.; Bruce, T.F.; Bridges, W.C.; Klaine, S.J. Responses of Hyalella azteca to acute and chronic microplastic exposures. *Environ. Toxicol. Chem*., **2015**. doi:10.1002/etc.3093

15. Murphy, F.; Quinn, B. The effects of microplastic on freshwater Hydra attenuata feeding, morphology, reproduction. *Environ. Pollut*., **2018**. doi:10.1016/j.envpol.2017.11.029

16. Kalčíková, G.; Žgajnar Gotvajn, A.; Kladnik, A.; Jemec, A. Impact of polyethylene microbeads on the floating freshwater plant duckweed Lemna minor. *Environ. Pollut*. **2017**. doi:10.1016/j.envpol.2017.07.050

17. de Ruijter, V.N.; Redondo-Hasselerharm, P.E.; Gouin, T.; Koelmans, A.A. Quality criteria for microplastic effect studies in the context of risk assessment: A critical review. *Environ. Sci. Technol*. **2020**. https://pubs.acs.org/doi/10.1021/acs.est.0c03057

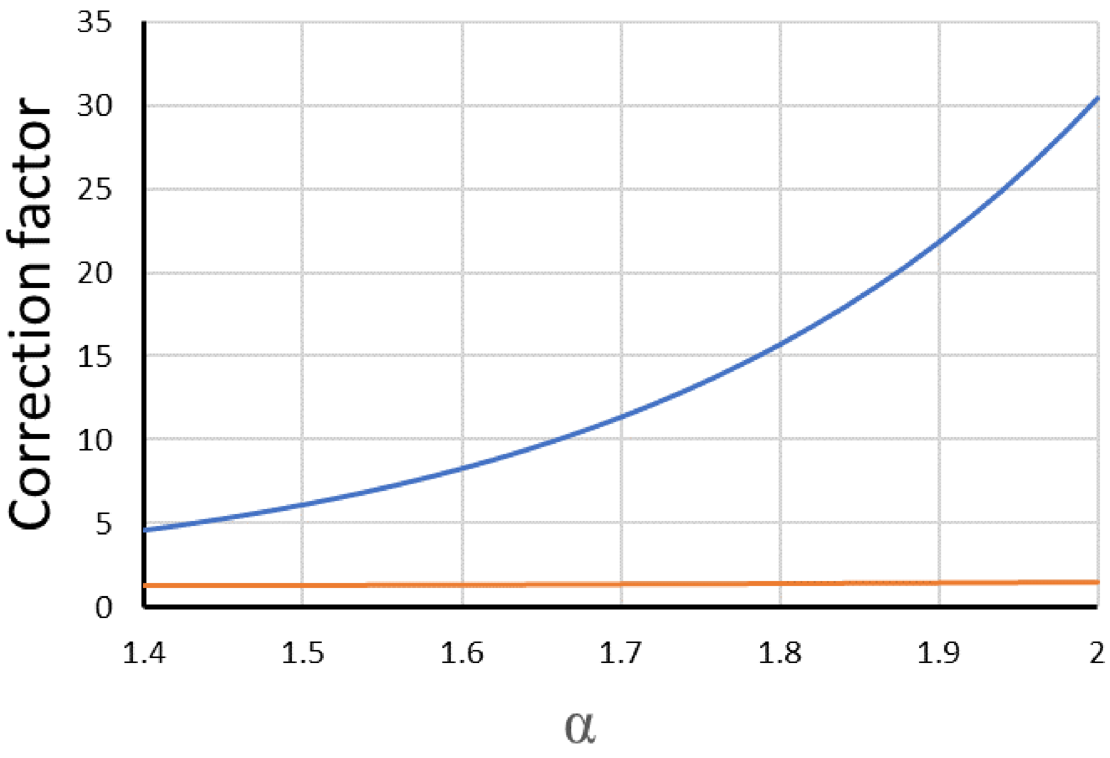

Figure S1: Correction factor required to correct 333-5000 µm microplastic number concentration data to a default size range of 1-5000 µm data (blue curve), or 20-5000 µm (orange curve), as a function of the exponent α in eq. 1.

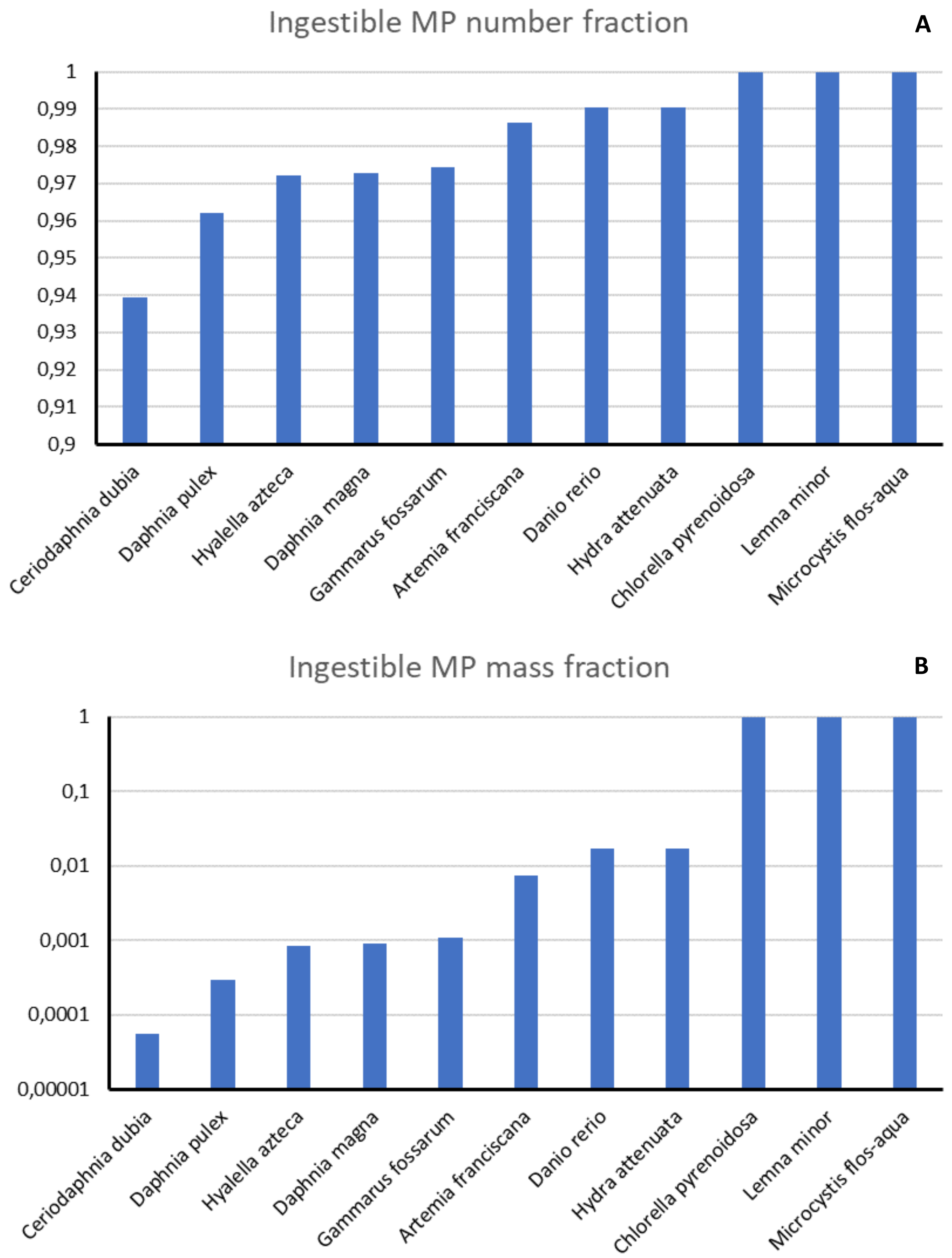

Figure S2: Number concentrations (A) and mass concentrations (B) for the fraction of environmentally relevant polydisperse microplastic (MP) which are ingestible by the 11 species used in the freshwater species sensitivity distributions (SSD).