



Can Fish Toxicity Data Reliably Predict Toxicity to Aquatic Stages of Amphibia – Re-evaluation of a Database by Formulation

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INTRODUCTION

The EFSA Opinion Paper on the risk of pesticides to reptiles and amphibians [1] aims to answer – among many other points – how much additional testing is necessary for a protective risk assessment (RA) for amphibians and reptiles. On behalf of EFSA, endpoints (largely LC50 endpoints) of amphibia and of fish were gathered and compiled in a supporting publication [2] as Appendix K, comparing their sensitivity.

These data proved to be very heterogeneous, in particular regarding the test substance (a.s. or formulation) there was often no close match. The data also included datapairs with astounding differences in sensitivity, differing by several orders of magnitude, in both directions. This led to EFSA's conclusion that fish endpoints were not a good predictor for amphibian endpoints – in contrast to other reviews, e.g. Weltje et al. 2013 [3].

Therefore, EFSA proposed an additional assessment factor of 100 for cases where amphibia were not tested separately, but where fish endpoint served as surrogates in the amphibian RA.

We expected that the database could be improved if data pairs were defined strictly by formulation; and that such an improved - i.e. more stringent - database was likely to include fewer cases with huge differences in sensitivity between fish and aquatic amphibia stages. In addition, we included more recent papers (2024).

● Targets:

1. Improve database
2. Scrutinize cases with huge differences and expand database
3. Reassess if regular testing of aquatic amphibians is needed
4. Reassess any assessment factor to bridge between fish and amphibian toxicity

Results: If RQ >1, amphibia more sensitive

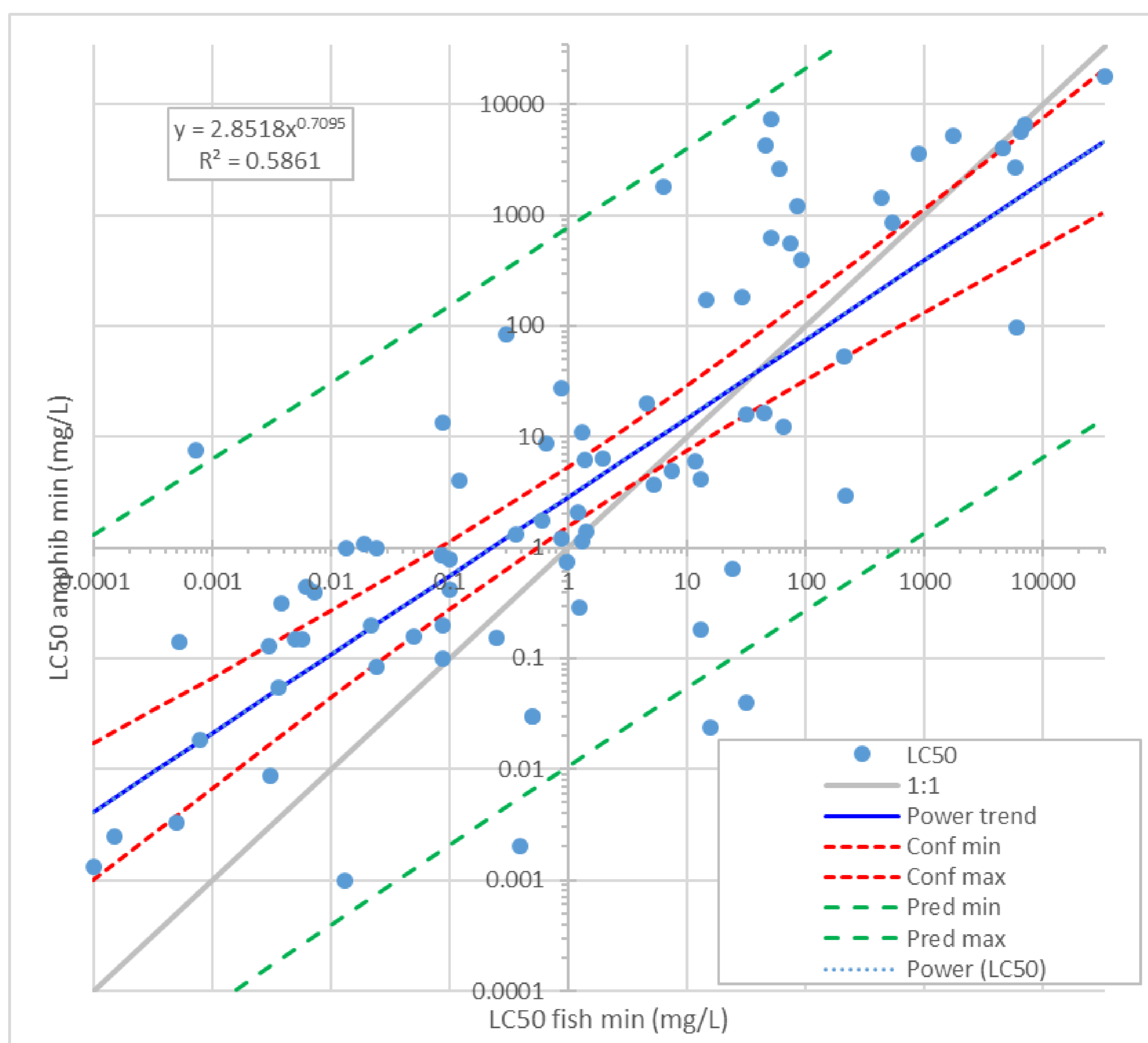
	Original	Revsd. [4]	Expanded
n	81	66	164
RQ Median	0.29	0.19	0.262
RQ 95%ile	75.3	3.9	4.8
RQ <0.33	54%	56%	53%
RQ ≥0.33 and ≤3	27%	36%	35%
RQ >3	19%	8%	12%
RQ >10	14%	1%	1%

Method: consolidate and expand data base (newer data)

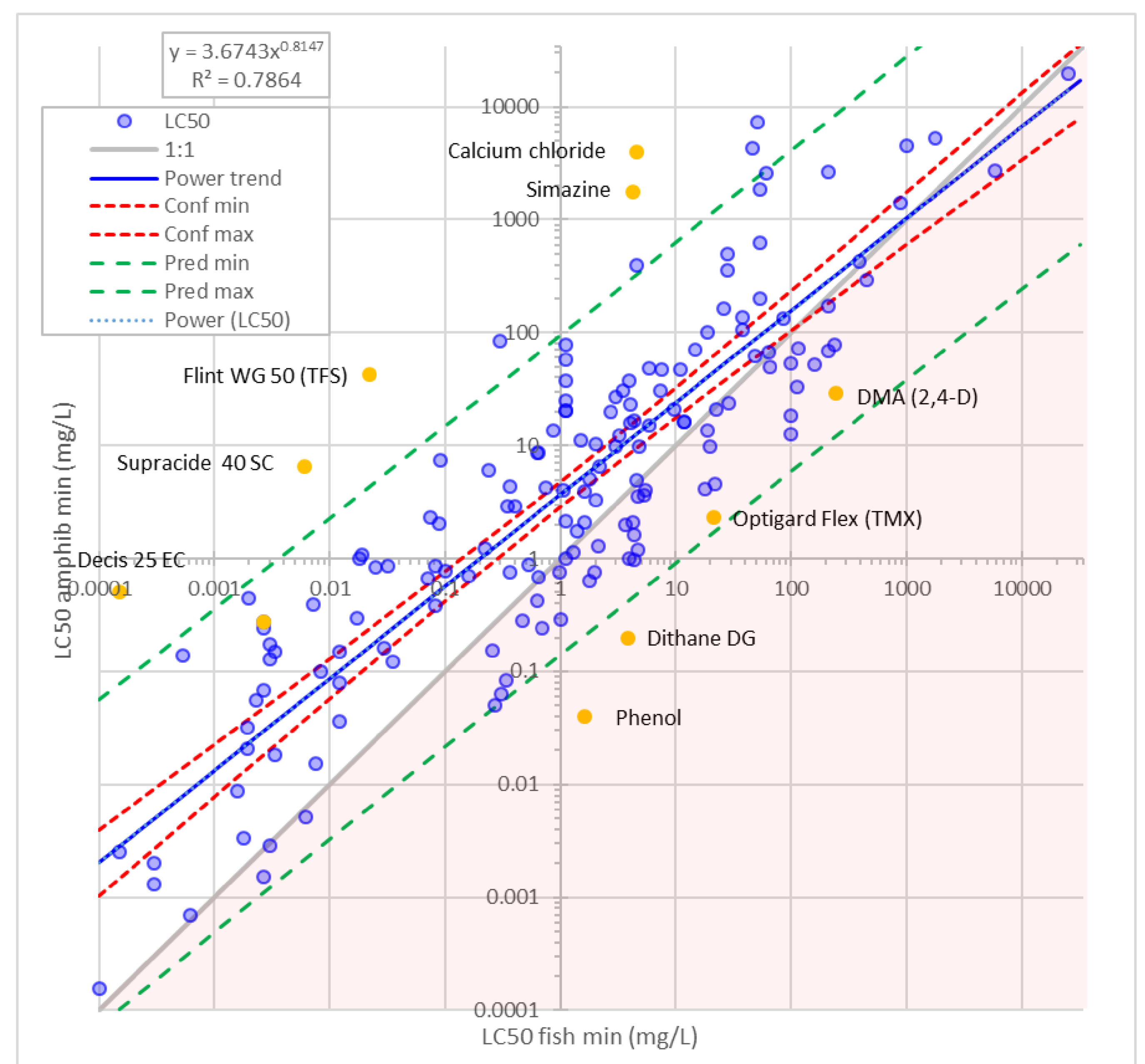
The fish and amphibia data of the supplement (Appendix K) had been reviewed and corrected previously (Christl et al. 2023, SETAC Poster: ID: 1.01.P-Tu025, [4]).

Prior to publication we decided to expand the database with a formal literature search for newer data (LC50 of aquatic amphibia stage since 2016). Next, potential matching fish endpoints were retrieved with the exact test material (formulation) that was used in the amphibia test: data from dossiers, DARs, RARs, SDS, which proved to be a reliable and easily accessible source for virtually all formulations, so that generally matching LC50 endpoints of fish could be included; the lowest in case of multiple endpoints, often *O. mykiss* (rainbow trout), which is a consistently sensitive species.

Data were paired by test item. i.e. a.s. or formulation, but there are also cases of multiple datapairs for one a.s. If there were multiple datasets per test item, the lowest values were included. Uncertain cases were checked, if unresolved, they are yellow & labelled in the right figure below.



Original data: as listed in EFSA opinion paper, Appendix K



Revised & expanded data: matching formulation amphibia & fish endpoints

● RESULTS & CONCLUSIONS

The data presented by EFSA [1] in Appendix K of the supporting publication [2] were misleading. Of the cases where fish endpoints were more than a factor of hundred higher than amphibians in EFSA's database, none could be confirmed. The perceived uncertainty of fish data as predictor for amphibian toxicity is largely caused by the mismatch of amphibian and fish endpoints in the database. The revised database confirms a similar relationship as between LC50 of cold-water- and warm-water fish, these were found to be consistently less sensitive than cold-water fish, so testing warm-water fish is no longer required. Also aquatic stages of amphibia are found to be consistently less sensitive than cold-water fish, so testing the latter is sufficient. Also, no additional assessment factor to bridge between fish and amphibia is deemed necessary, same as in case of cold- and warm-water fish.



[1] EFSA 2018 Scientific Opinion on the state of the science on pesticide risk assessment for amphibians and reptiles. EFSA Journal 16(2): 5125 doi: 10.2903/j.efsa.2018.5125

[2] EFSA Supporting Publication - Ortiz-Santaliestra ME, Maia JP, Egea-Serrano A, Brühl CA, Lopes I. 2017. Biological relevance of the magnitude of effects (considering mortality, sub-lethal and reproductive effects) observed in

studies with amphibians and reptiles in view of population level impacts on amphibians and reptiles. EFSA supporting publication 2017:EN-1251. 151 pp. doi:10.2903/sp.efsa.2017.EN-1251; therein Appendix K.

[3] Weltje et al. 2013-Comparative acute and chronic sensitivity of fish and amphibians- a critical review of data. Env Tox Chem 32(5) 984-994

[4] Christl et al. 2023, SETAC Poster: ID: 1.01.P-Tu025