

# The Minimum Detectable Difference (2): Appropriate experimental design and endpoint selection for algae in mesocosm studies



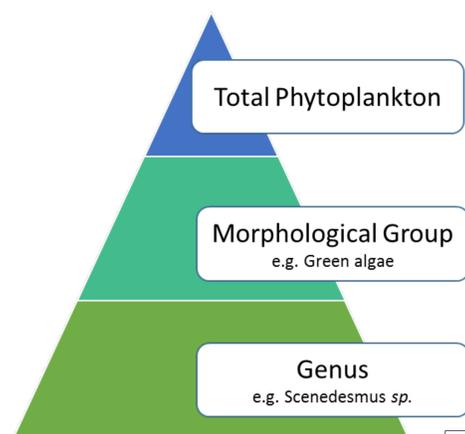
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## 1. INTRODUCTION

- Algae are important primary producers within an aquatic community. However, populations are in a constant state of flux and their interactions are poorly understood.
- The introduction of Minimum Detectable Differences (MDDs) to EFSA guidance (EFSA, 2013) has led to the increased discussion about the selection of suitable endpoints and the potential for grouping algae datasets into higher taxonomic levels for analysis.
- The phytoplankton results from a recent mesocosm study will be used to assess the suitability of a current algae sampling method and to demonstrate the impact that grouping data into higher taxonomic groups has on MDD values, NOECs and the Effect Classifications.

## 2. METHOD



## 3. RESULTS

- Data at genus level can provide good MDDs (Table 1)
- Poor MDDs are mainly associated with algae of naturally low abundance, colonies, and large filaments.
- In this analysis, statistically significant effects were observed for *Pediastrum* sp. however, these were discarded due to poor MDDs, and contributed to defending the NOEC.

Table 1. MDD Categories (Brock et al., 2014) for Non grouped and Grouped Data

Grouping	No. taxa	No. Taxa in MDD category			% Category 1
		Cat 1	Cat 2	Cat 3	
Genus	47	9	3	35	19
Morphological	6	5	0	1	83
Total Phytoplankton	1	1	0	0	100

## 6. References

Brock, T. C. M., Hammers-Wirtz, M., Hommen, U., Preuss, T. G., Ratte, H-T., Roessink, I., Strauss, T. and Van den Brink, P. J., 2014. The minimum detectable difference (MDD) and the interpretation of treatment-related effects of pesticides in experimental ecosystems. *Environ Sci Pollut Res* 22: pp. 1160-1174  
 EFSA PPR Panel (EFSA Panel on Plant Protection Products and their Residues) 2013 Guidance on tiered risk assessment for plant protection products for aquatic organisms in edge-of-field surface waters. *EFSA Journal* 2013;11(7):3290

## 4. RESULTS Continued

- Grouping to high taxonomic levels improves MDD values, with a higher proportion of taxa falling into MDD Category 1 (Table 1)
- Where a genus with clear effects was dominant within a group, the MDD values were improved by grouping the data without impacting the NOEC

“Grouping improves MDD values”

Table 2. NOEC and Effect class for different trophic levels

Grouping	NOEC	Effect Class
Genus	0.1	5B
Morphological	2.5	3A
Total Phytoplankton	2.5	2

Sensitivity ↓

- In this analysis, the NOEC observed was lower at genus (0.1 µg/L) than pooled into morphological group (Green algae = 2.5 µg/L) (Table 2) suggesting a decrease in sensitivity.

“Grouping increased the NOEC from 0.1 to 2.5 µg/L”

“Grouping can reduce sensitivity”

- Where poor MDDs were observed at genus level, number. taxa per morphological group were analysed. This provided a NOEC supported by good MDD values.

## 5. CONCLUSIONS & RECOMMENDATIONS

### Method

- Siphoning method does allow for the determination of suitable endpoints for algae.
- Further improvements could be made to algae sampling techniques to ensure adequate collection and concentration of samples. Improvements could include further concentration of samples or increasing volume of water collected. Sampling techniques are paramount as “seeding ponds” to ensure standardisation is not possible.
- Potential to develop new counting methods focusing on improving filament and colony counts e.g. count as colonies not individual cells would reduce standard deviation between replicates.

### Grouping

- Analysis using both genus and grouped data will be necessary to determine robust endpoints.
- Grouping can be useful in improving MDD values, however this needs to be used in conjunction with genus analysis to ensure “true” NOEC is observed and effects are not masked.
- Further analysis is required on a larger dataset to determine if these observations are study specific only.
- In addition, further research into how grouping to other taxonomic levels (e.g. class and family) impact on MDD values, NOECs and effect classification.

“Poor MDDs are associated with colonies and filaments”