

Appendix S7—Scatter Plots of Probabilities of Observing a Genus: Step-by-Step Calculation and Spreadsheet Tools for Predicting Stressor Levels that Extirpate Genera and Species

Susan M. Cormier[†], Lei Zheng[‡], Erik W. Leppo[‡], and Andrew Hamilton[‡]

[†]U.S. Environmental Protection Agency, National Center for Environmental Assessment, Cincinnati, Ohio

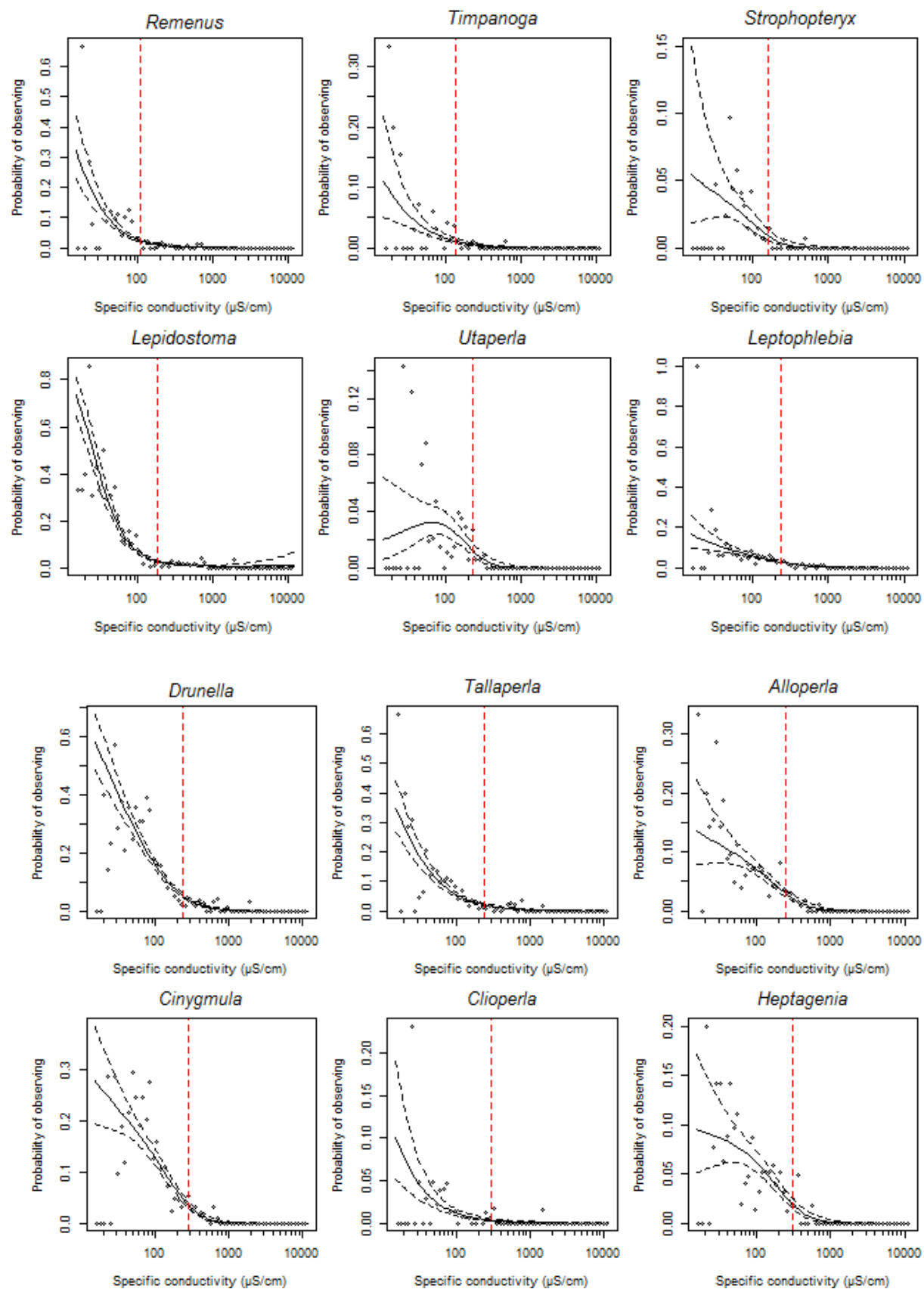
[‡]Tetra Tech, Inc., 0711 Red Run Blvd., Suite 105, Owings Mills, MD 21117, USA

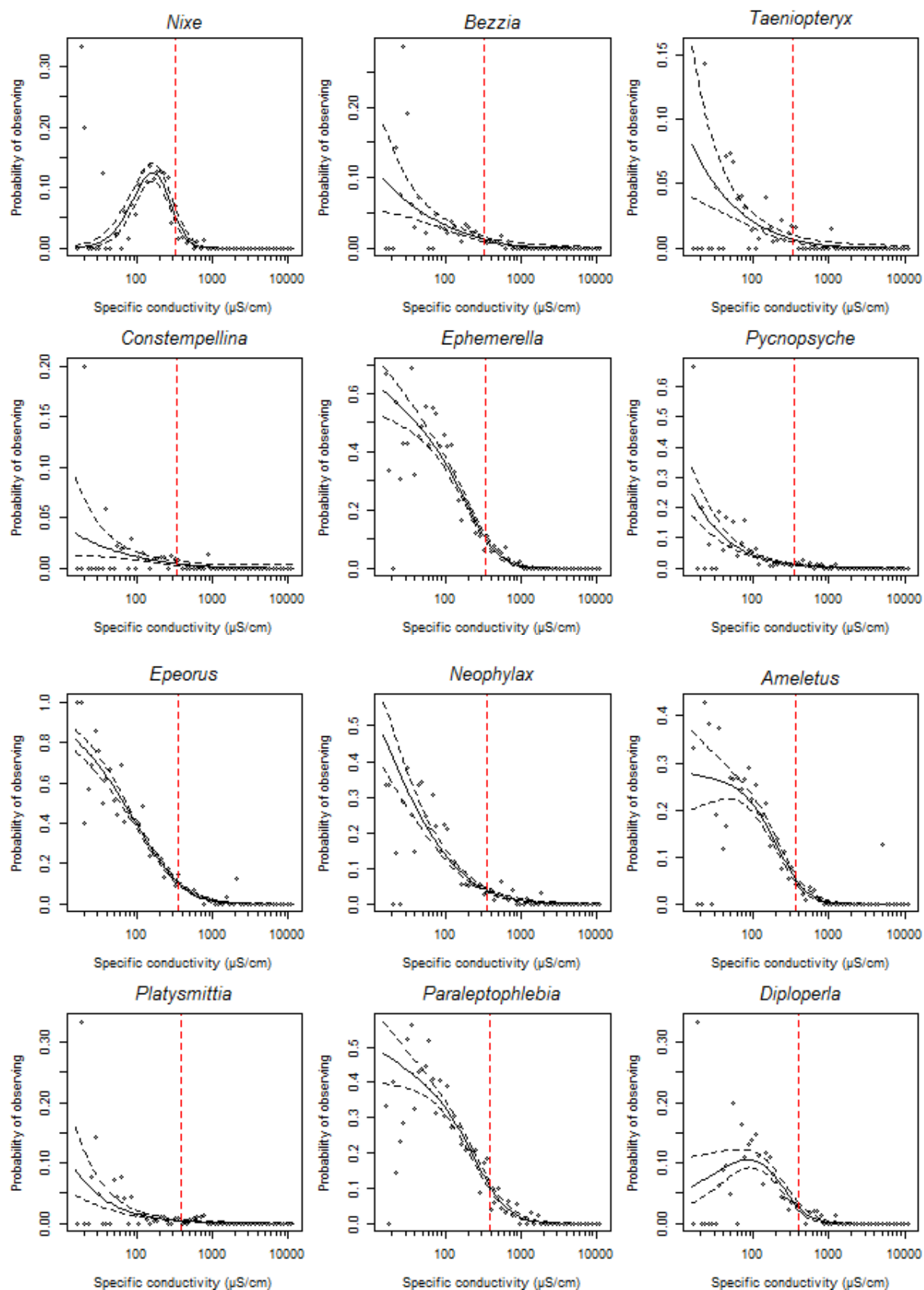
Key Words: calculation tool, Excel, extirpation, field-based benchmark, specific conductivity, XC₉₅, HC₀₅, XCD, streams, Appalachia, aquatic life, sensitivity distribution, tolerance, ionic

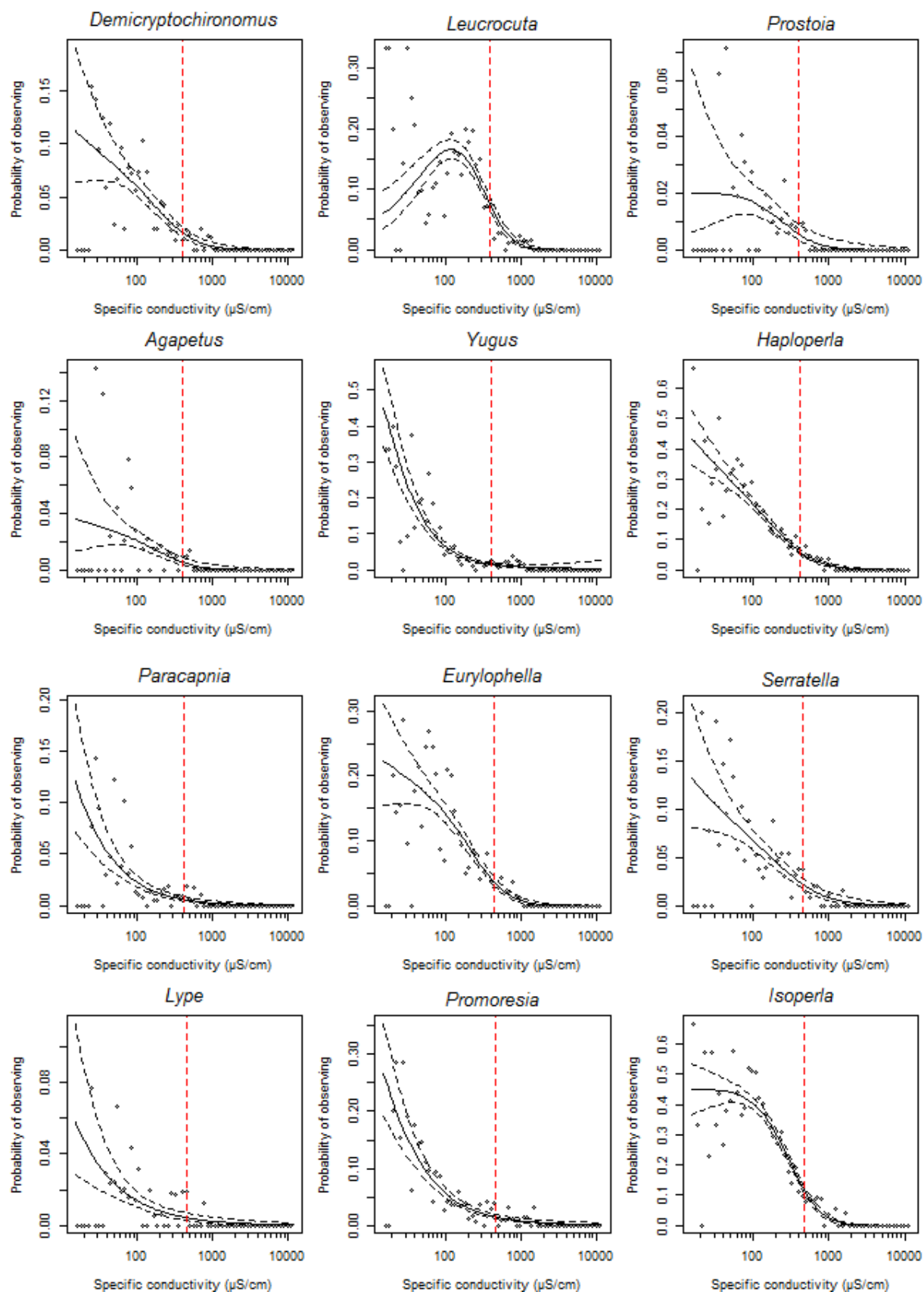
INTRODUCTION

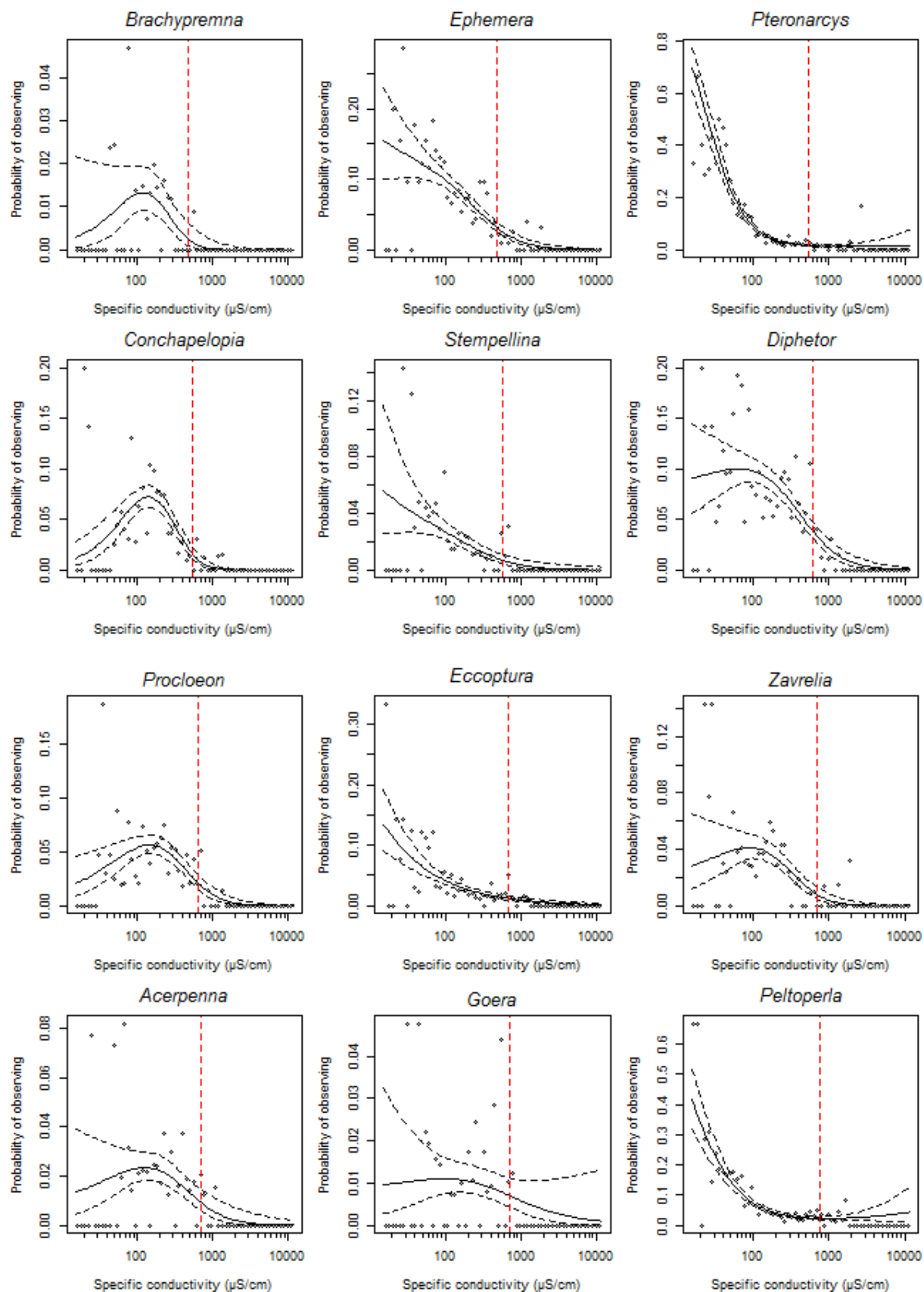
This supplemental material is associated with (Cormier et al. 2018c). The 95th extirpation concentration (XC₉₅) Biological Extirpation Analysis Tool (BEAT) produces scatter plots of the probability of observing a taxon at a site as a function of the measured stressor concentration. This supplemental appendix (S7) provides similar plots to those produced by XC₉₅ BEAT, but they were prepared with the open software R (R Core Team 2014, Leppo 2018). These scatter plots are overlain with a generalized additive model (GAM) that was used to qualify reliability of the XC₉₅ values reported in Appendix S6, Cormier et al. 2018b). The methods for developing them are described elsewhere (EPA 2011, 2016, Leppo 2018). The symbols indicate that the XC₉₅ is clear (=), approximate (~) or greater than (>) the calculated value.

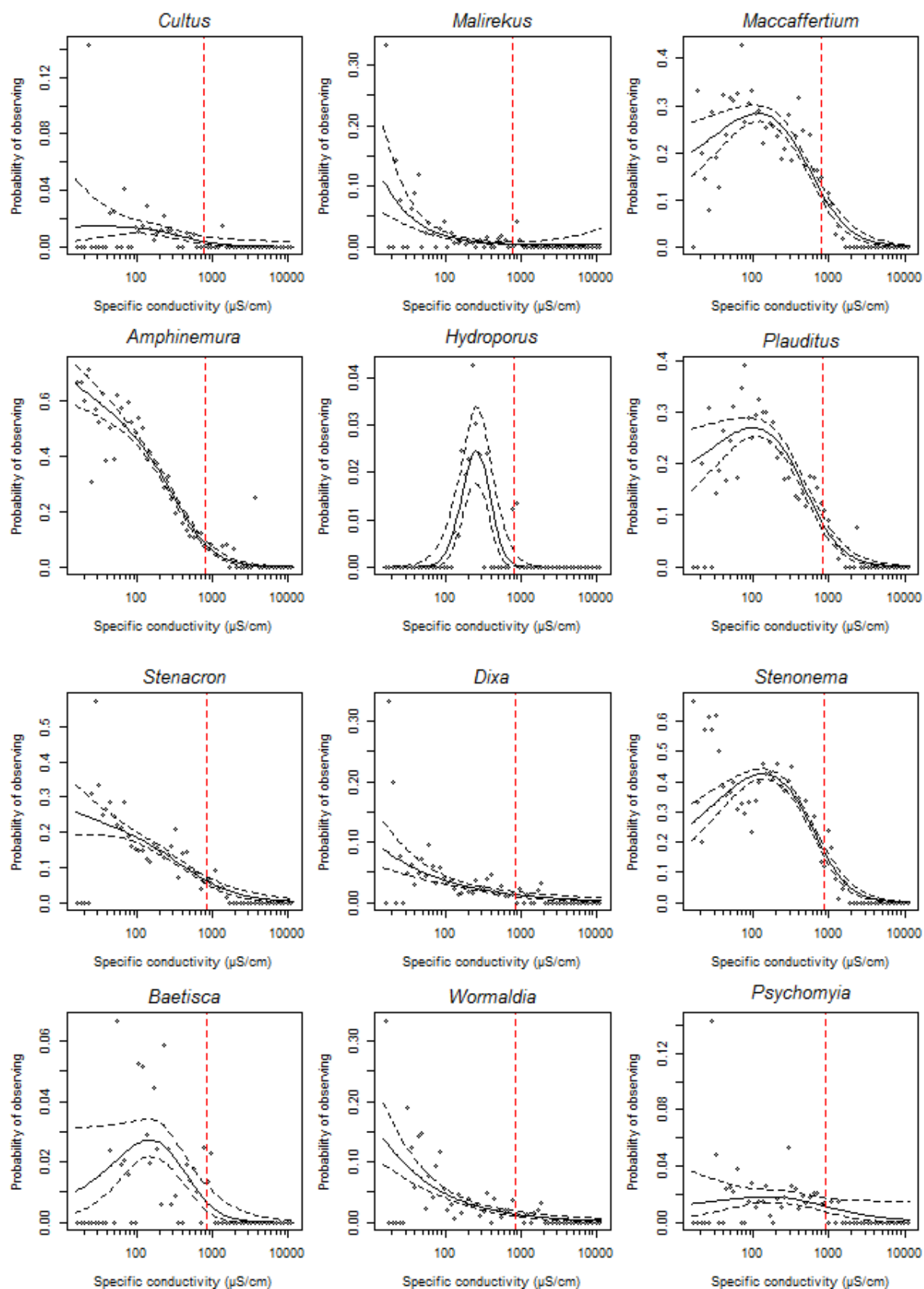
In this example, the probability of observing a genus is the proportion of sampled stations in a conductivity bin with the genus present. Conductivity is reported as specific conductivity (μS/cm). The red, dashed vertical line is the XC₉₅ value for the genus (Appendix S6; Cormier et al. 2018b) that was obtained from the plots of the cumulative frequency distributions (CFD) in Appendix S6 and are included on the GAM plots to enable comparisons. Plots are arranged from the lowest to the highest XC₉₅ value. Methods are described in Cormier et al. (2018d) and EPA (2011, 2016). The data set from Ecoregion 69 and 70 is available in Appendix S5 (Cormier et al 2018a).

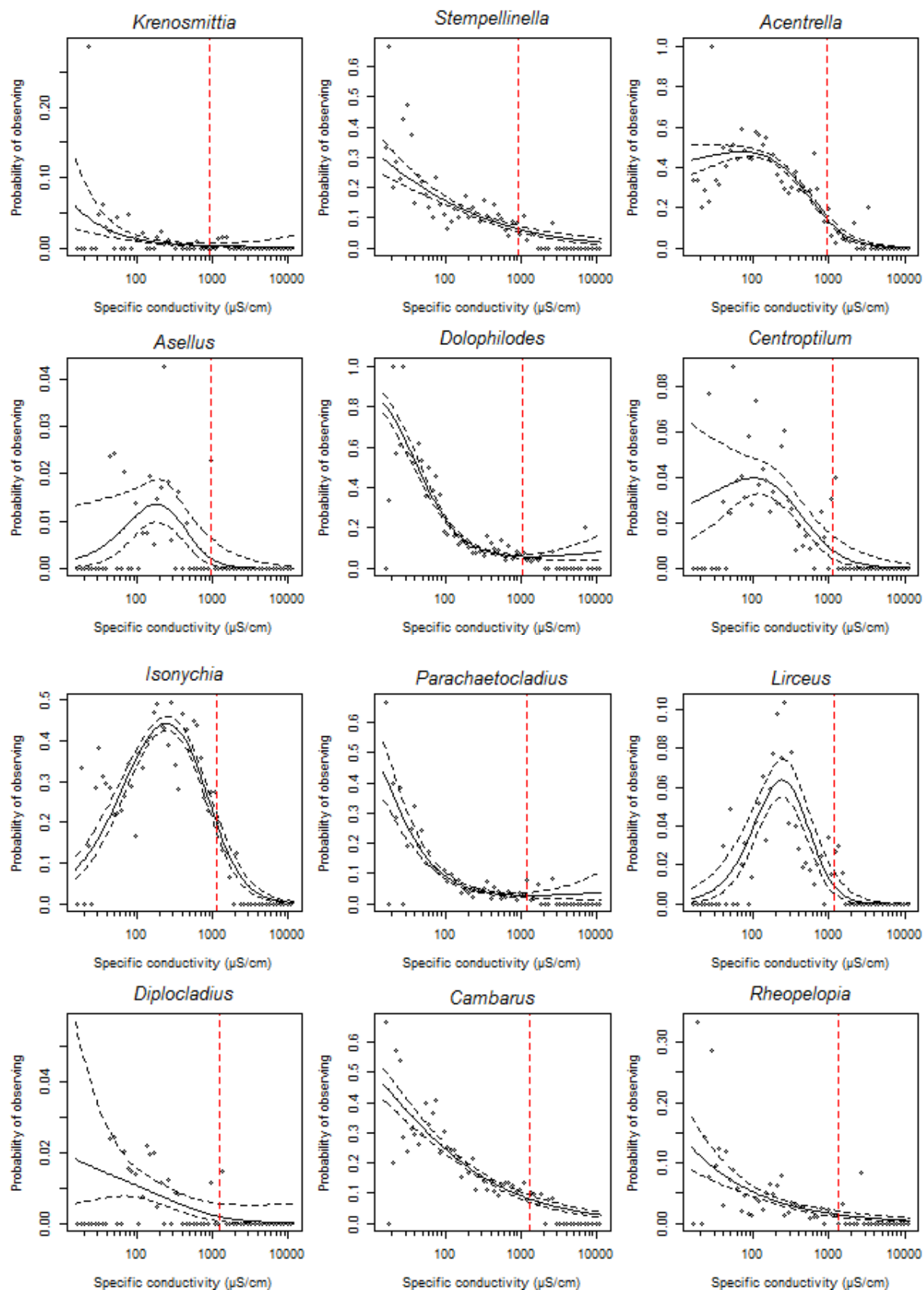


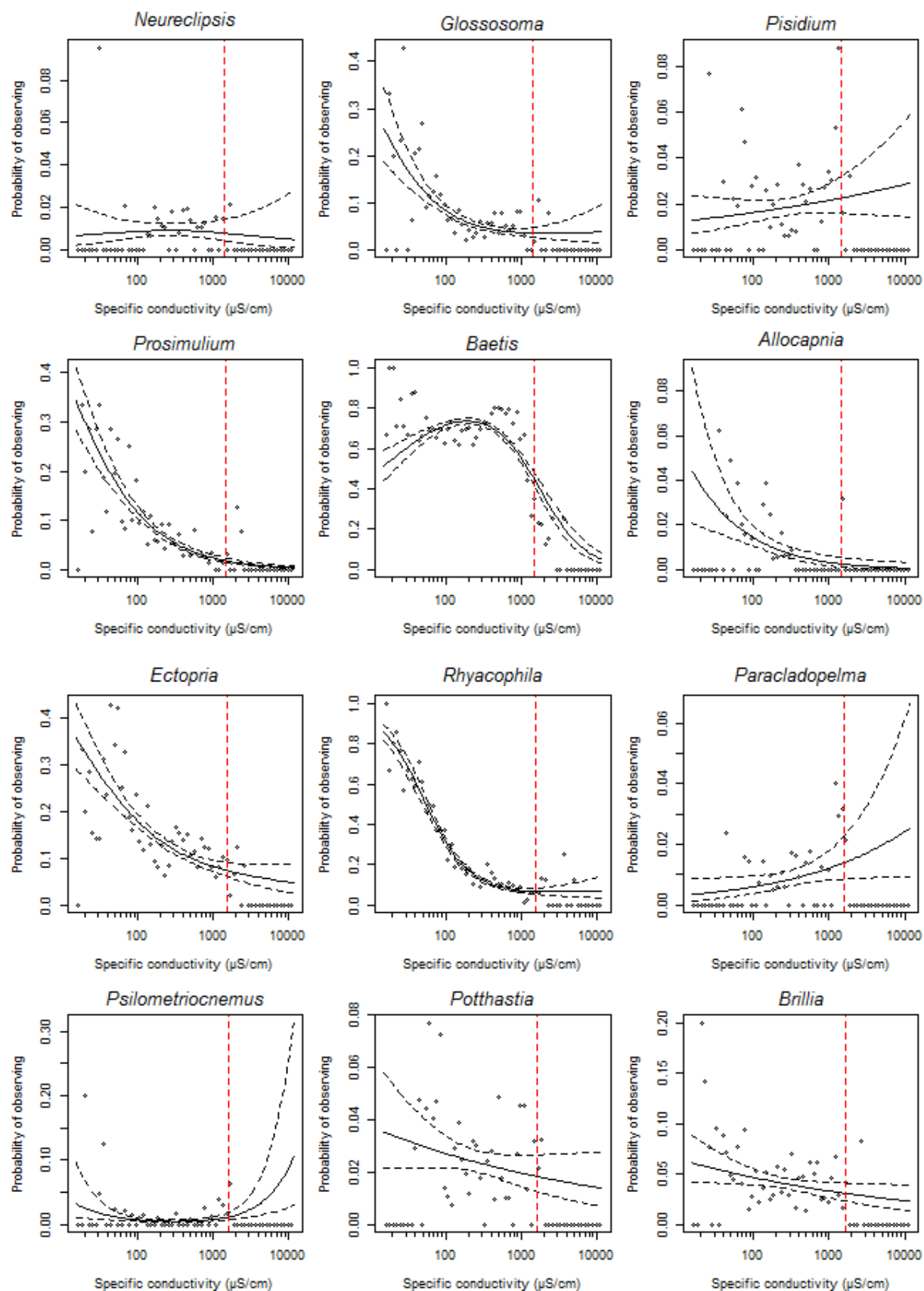


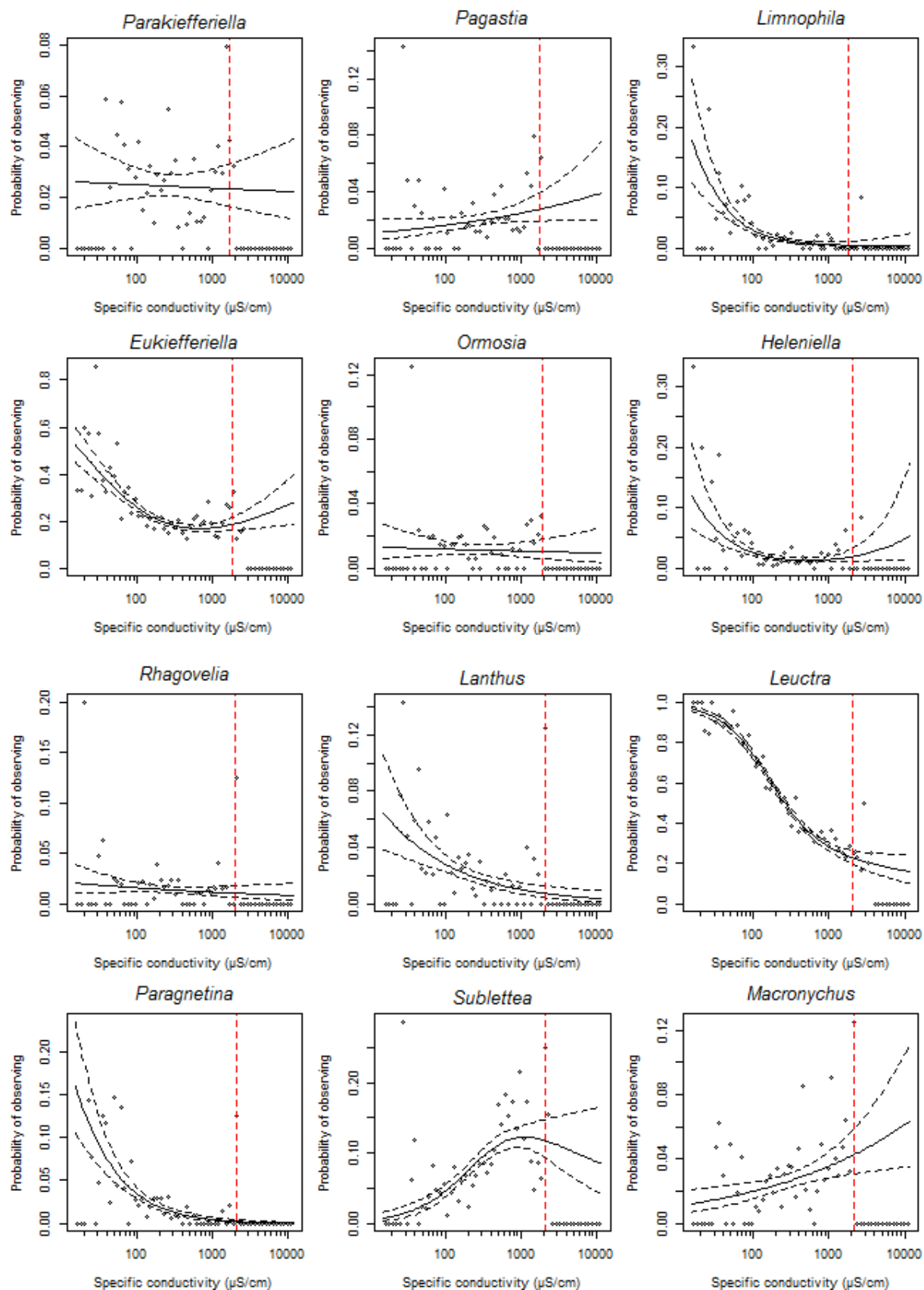


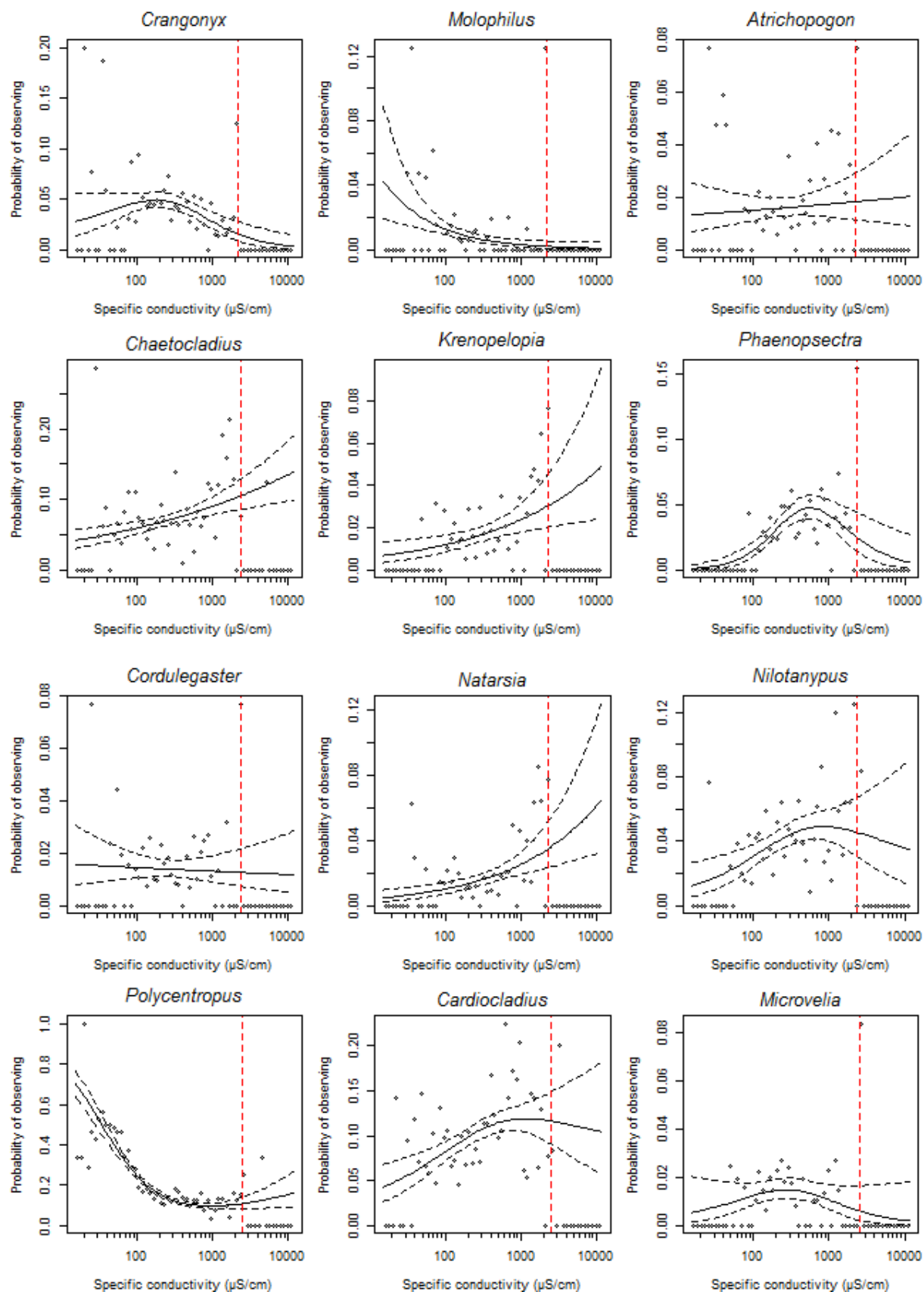


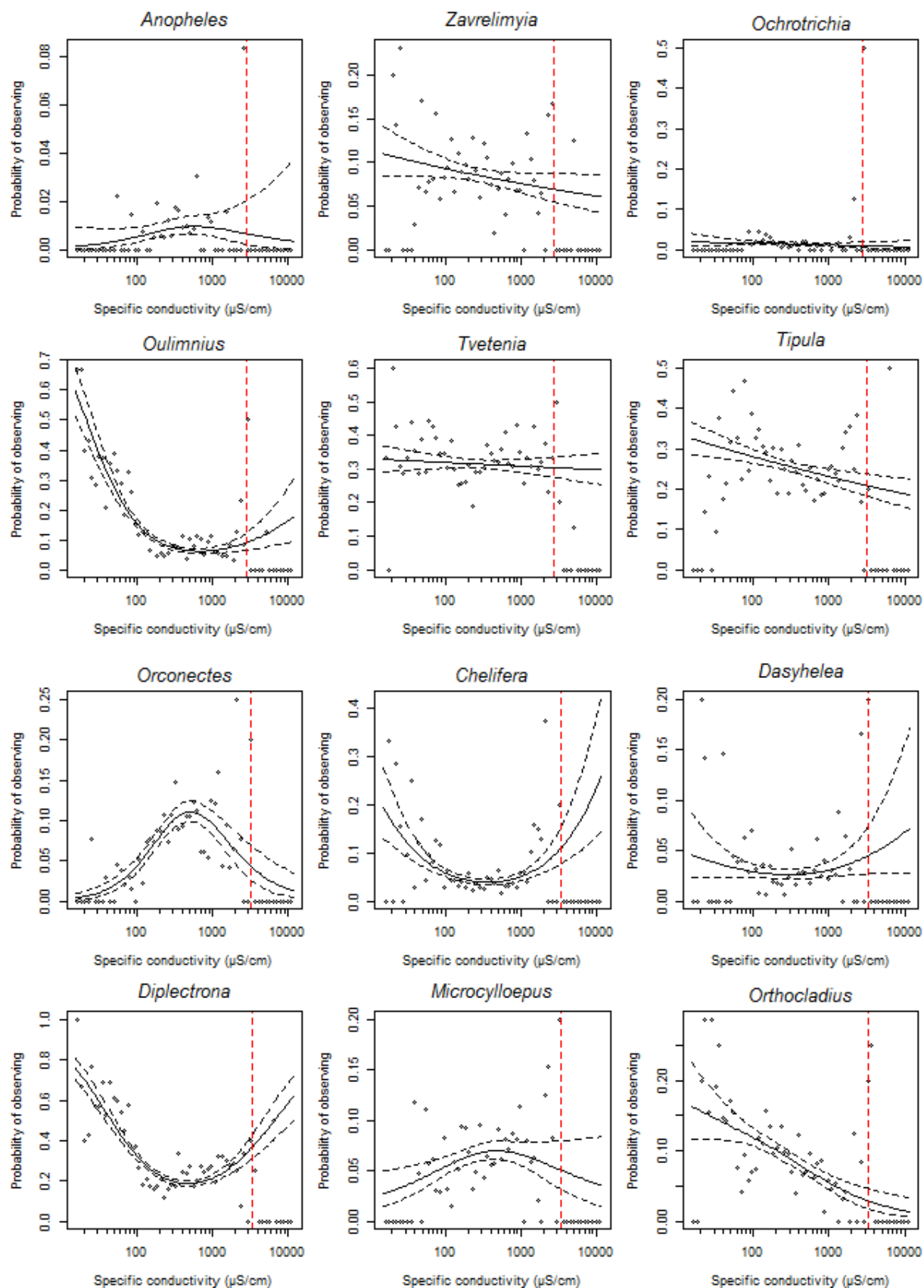


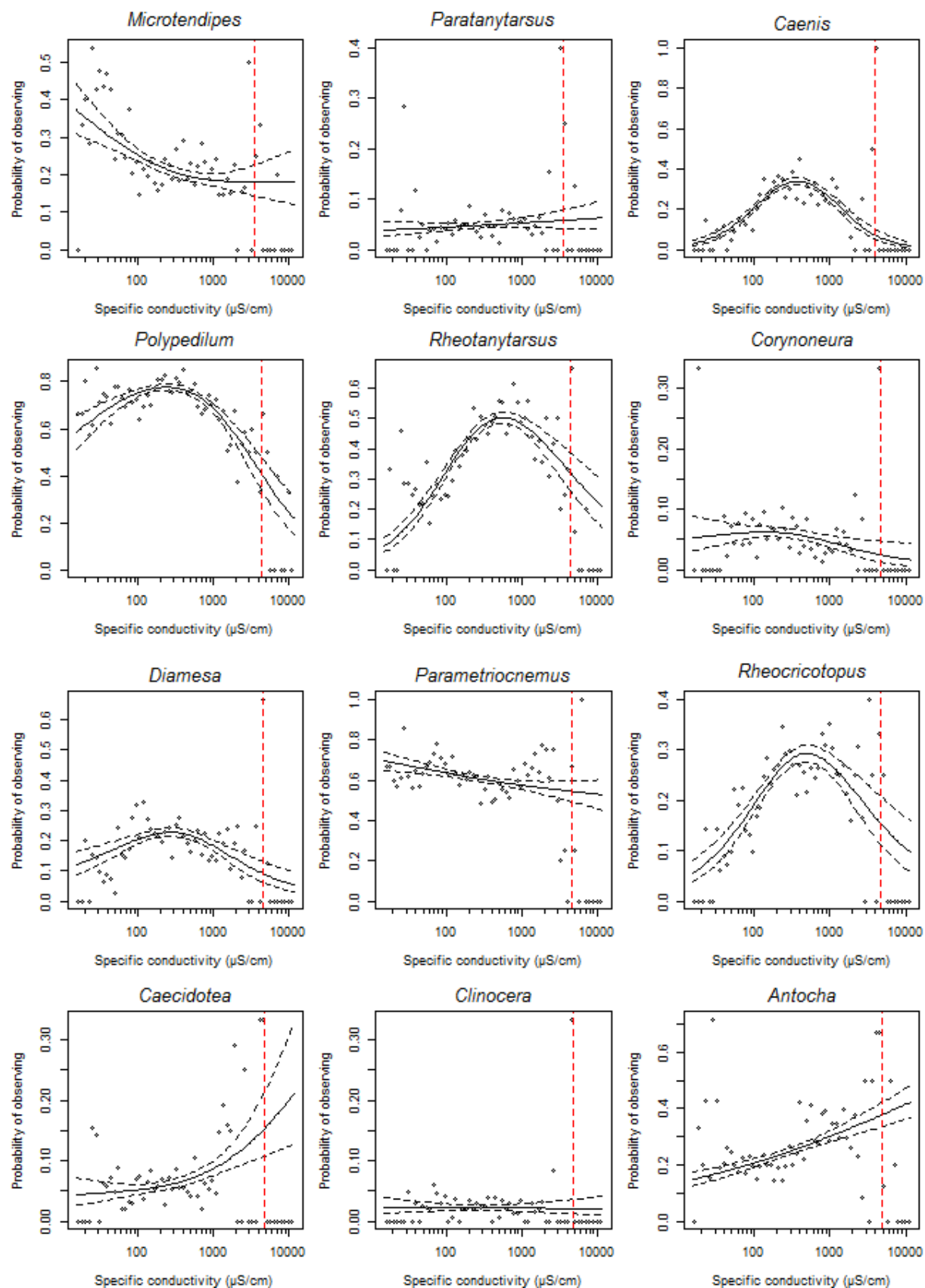


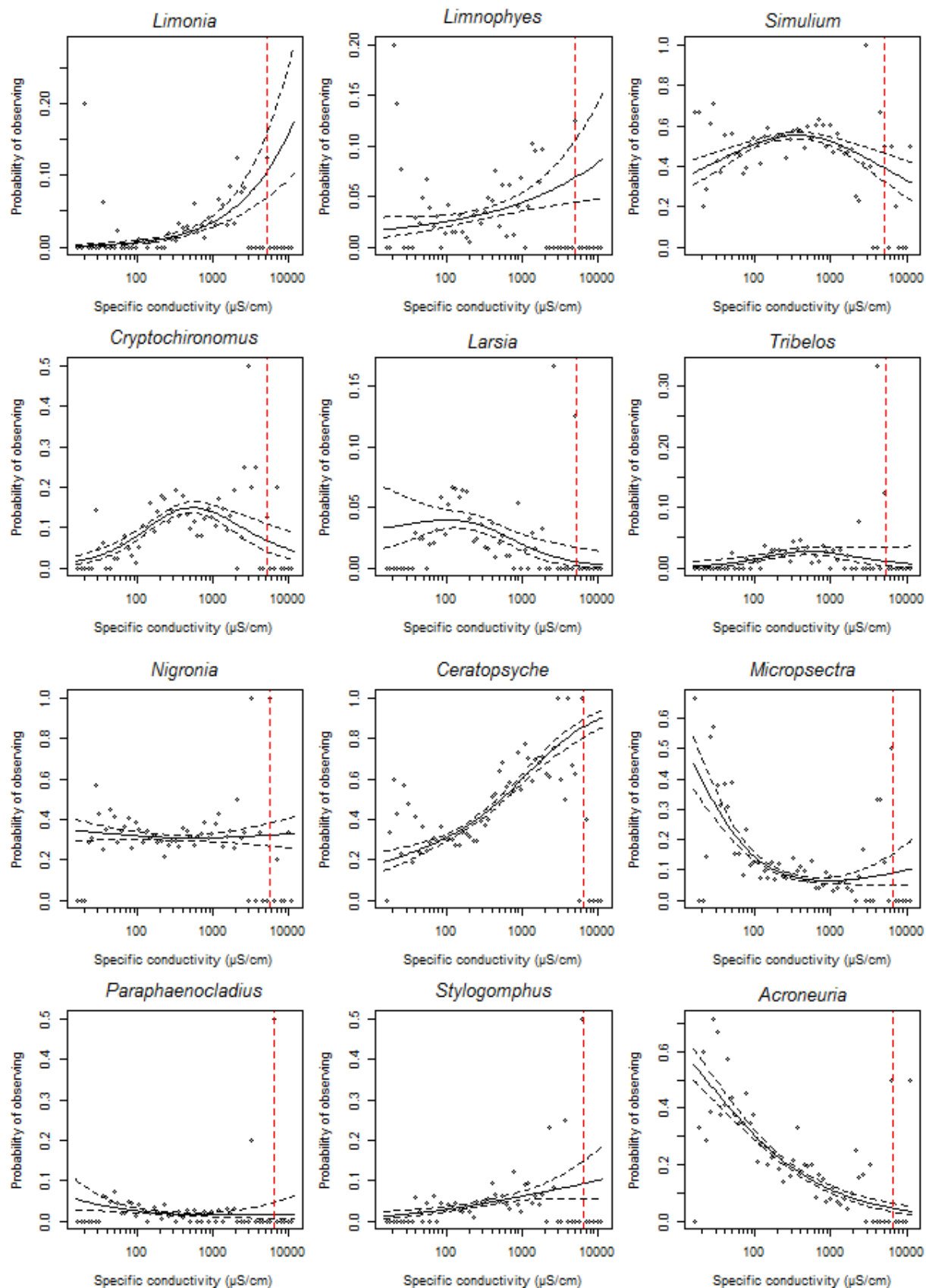


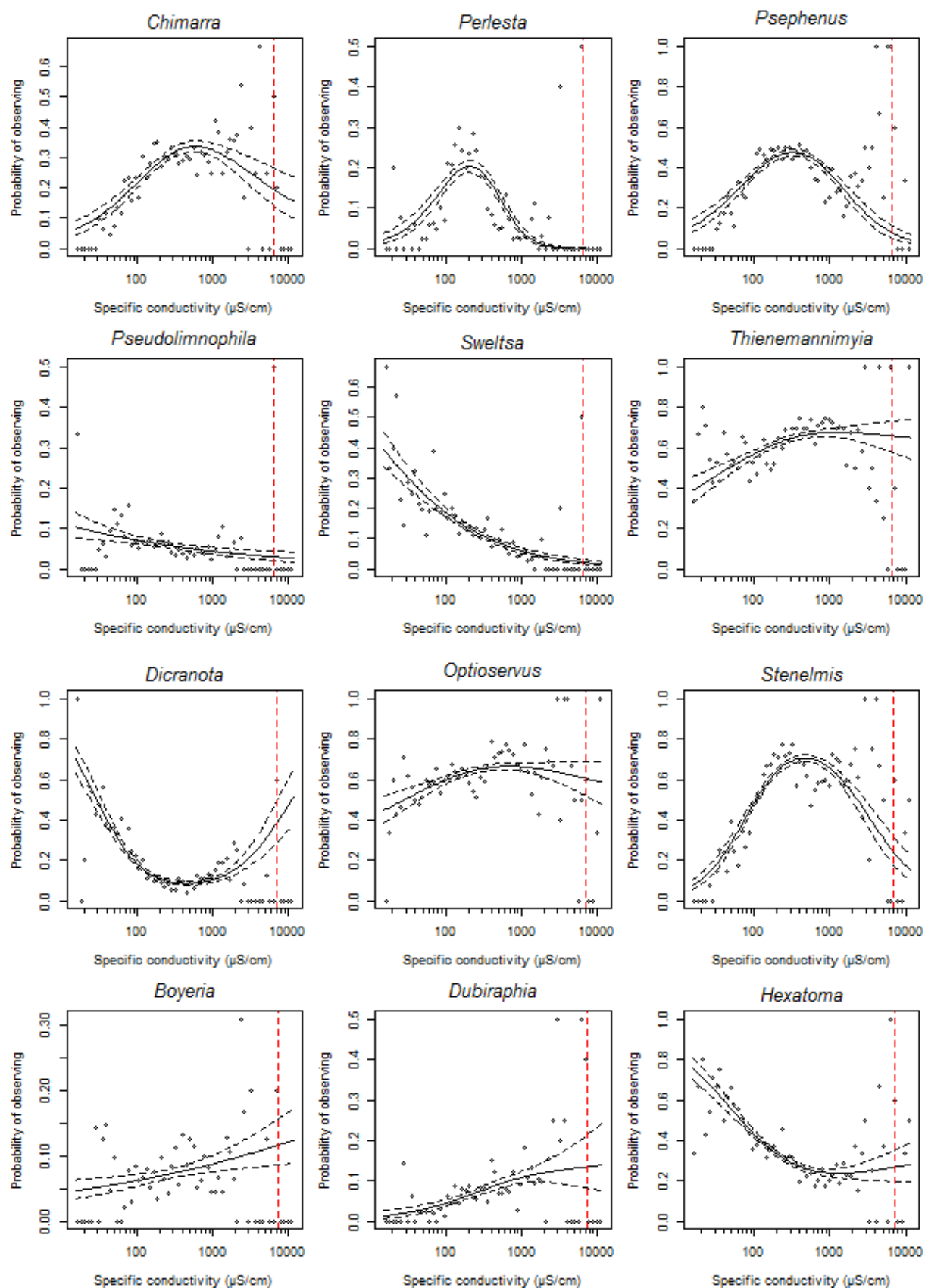


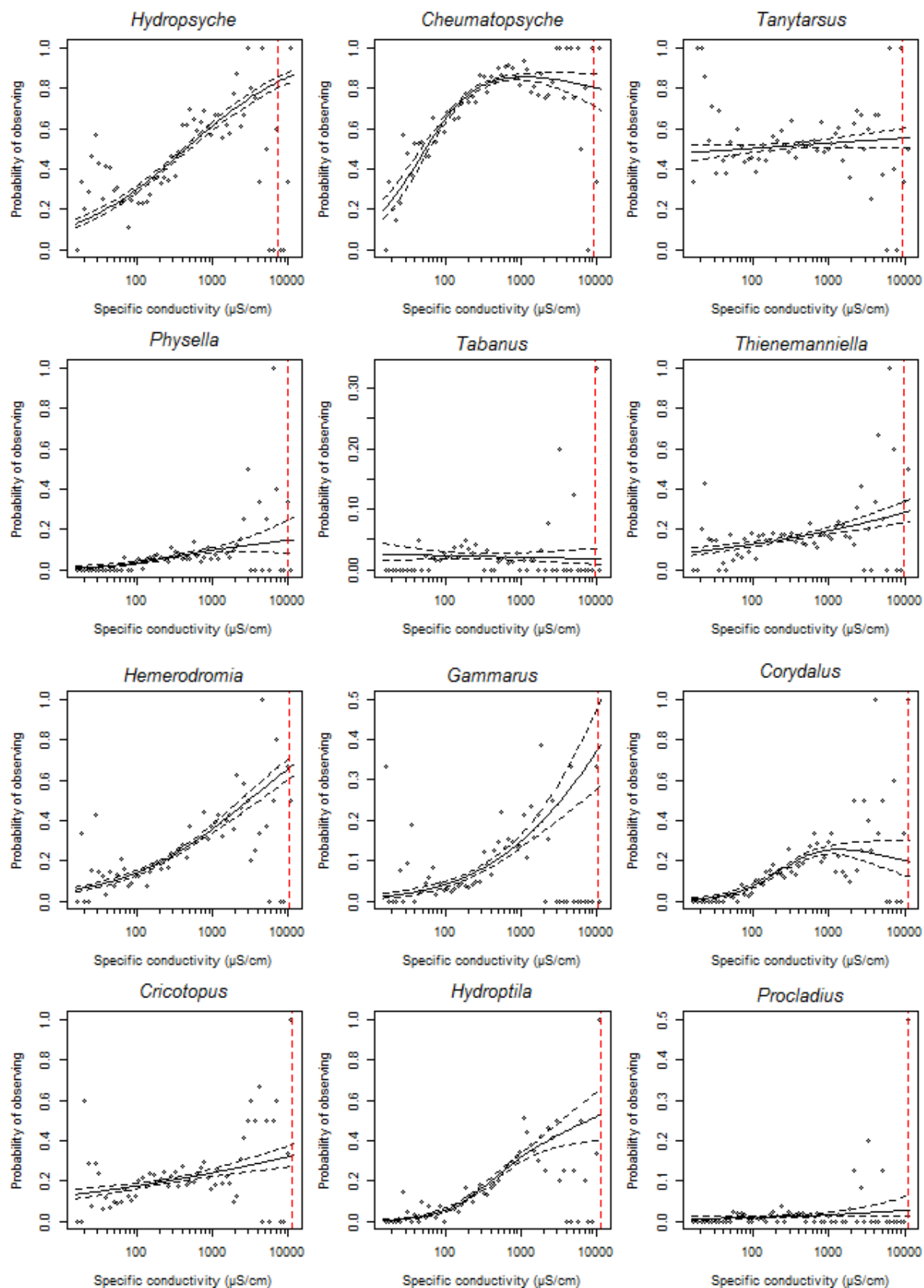


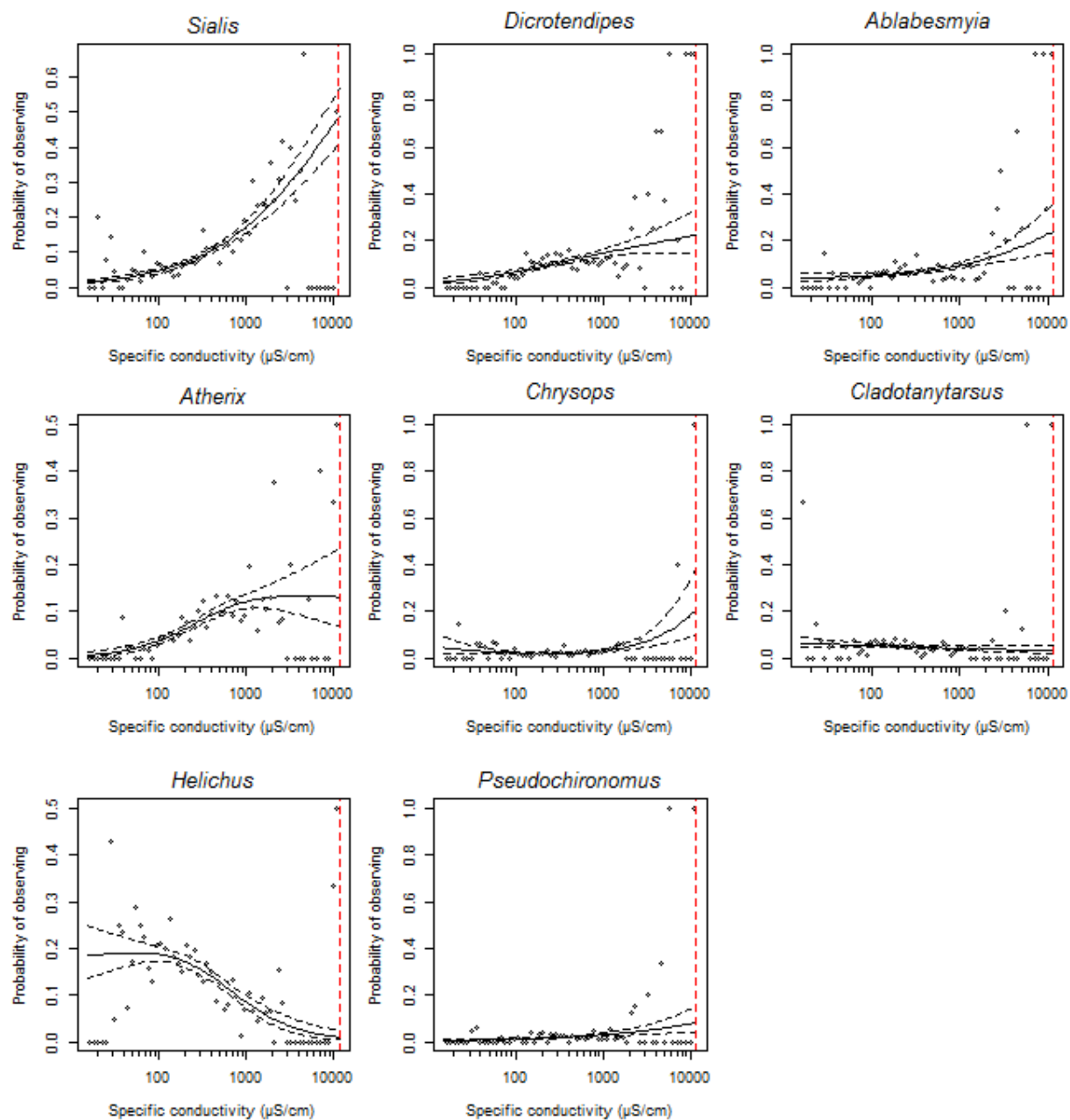












REFERENCES

- Cormier, S.M., Zheng, L., Leppo, E.W. and Hamilton, A., 2018a. Appendix 5. BEAT Data 69-70: Step-by-step calculation and spreadsheet tools for predicting stressor levels that extirpate genera and species. Integrated Environmental Assessment and Management.
- Cormier, S.M., Zheng, L., Leppo, E.W. and Hamilton, A. 2018b. Appendix 6. Extirpation concentration (XC95) values: Step-by-step calculation and spreadsheet tools for predicting stressor levels that extirpate genera and species. Integrated Environmental Assessment and Management.
- Cormier, S.M., Zheng, L., Leppo, E.W. and Hamilton, A. 2018c. Step-by-step calculation and spreadsheet tools for predicting stressor levels that extirpate genera and species. Integrated environmental assessment and management, 14(2), pp.174-180.
- Leppo, E. 2018. Extirpation analysis (XC95) for benthic macroinvertebrates and fish for environmental variables. <https://leppott.github.io/XC95>.
- R Core Team. 2014. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. <http://www.R-project.org/>.
- U.S. EPA (Environmental Protection Agency). 2011. A field-based aquatic life benchmark for conductivity in central Appalachian streams. U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment, Washington, DC. EPA/600/R-10/023F.
- [USEPA] US Environmental Protection Agency. 2016. Public review draft: field-based methods for developing aquatic life criteria for specific conductivity. Washington (DC), USA: U.S. Environmental Protection Agency, Office of Water. EPA-822-R-07-010.