

ssdtools: An R package to fit Species Sensitivity Distributions (SSDs)

2018-10-30

Summary

Species sensitivity distributions (SSDs) are cumulative probability distributions which are fitted to toxicity concentrations for multiple species (Figure 1). They are used for the derivation of environmental quality criteria and ecological risk assessment for contaminated ecosystems (Posthuma, Suter II, and Traas 2001).

ssdtools is an R package (R Core Team 2018) to fit log-normal (lnorm), log-logistic (llog), Gompertz, log-Gumbel (lgumbel), gamma or Weibull distributions to species concentration data.

The user can also define their own distributions. Multiple distributions can be averaged using Information Criteria (Burnham and Anderson 2002). The available Information Criteria are the Akaike Information Criterion (AIC), the Akaike Information Criterion corrected for small sample size (AICc) and Bayesian Information Criterion (BIC). Confidence intervals can be calculated for the fitted cdf or specific hazard concentrations (percentiles). The confidence intervals are currently produced by parametric bootstrap resampling.

ssdtools loads the **fitdistrplus** R package (Delignette-Muller and Dutang 2015) upon which it depends for model fitting, calculation of AIC and bootstrapping. **ssdtools** also loads the **ggplot2** R package (Wickham 2016) which it extends by defining **ssdfit**, **xribbon** and **hcintersect** geometries to allow the user to produce custom SSD plots.

Development of **ssdtools** was funded by the Ministry of Environment and Climate Change Strategy, British Columbia.

The software archive is at <https://github.com/bcgov/ssdtools>.

References

- Burnham, Kenneth P., and David R. Anderson. 2002. *Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach*. Vol. Second Edition. New York: Springer.
- Delignette-Muller, Marie Laure, and Christophe Dutang. 2015. “fitdistrplus: An R Package for Fitting Distributions.” *Journal of Statistical Software* 64 (4): 1–34. <http://www.jstatsoft.org/v64/i04/>.
- Posthuma, Leo, Glenn W Suter II, and Theo P Traas. 2001. *Species Sensitivity Distributions in Ecotoxicology*. CRC press. <https://www.crcpress.com/Species-Sensitivity-Distributions-in-Ecotoxicology/Posthuma-II-Traas/p/book/9781566705783>.
- R Core Team. 2018. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. <http://ggplot2.org>.

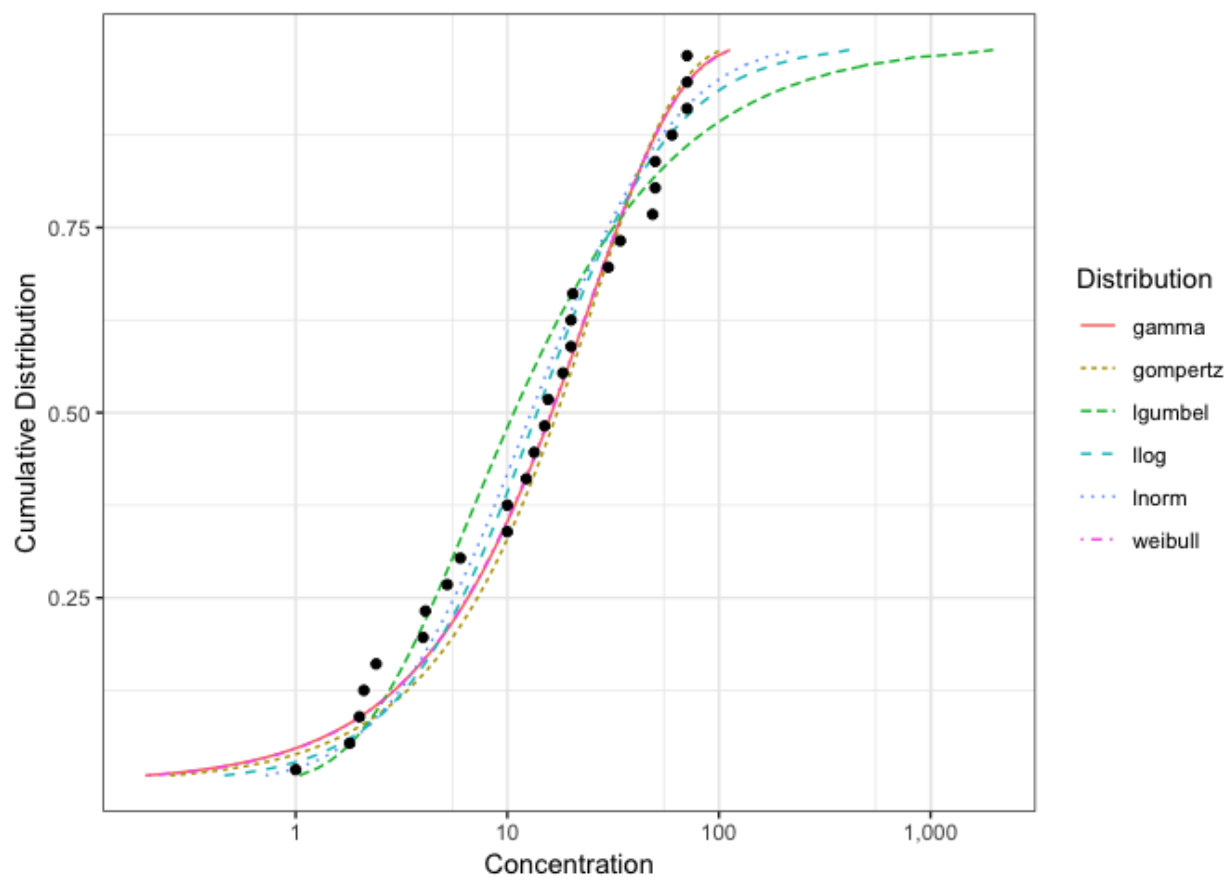


Figure 1: Species sensitivity distributions for sample species concentration values