Supplementary information - Exploring alternative Bayesian estimates of low- and no-effect concentration thresholds

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# jagsNEC model formulations

Where possible jagsNEC has aimed for consistency in the interpretable meaning of the individual parameters across models, and include:

usually interpretable as either the y-intercept or the upper plateau representing the mean concentration of the response at zero concentration;

, the No-Effect-Concentration value (the x concentration value where the breakpoint in the regression is estimated at;

, generally the exponential decay rate of response, either from 0 concentration or from the estimated value;

, representing the lower plateau for the response at infinite concentration;

= notionally the 50% effect concentration but may be influenced by scaling and should therefore not be strictly interpreted, and

In addition to the model parameters, all **NEC**-containing models have a step function used to define the breakpoint in the regression, which can be defined as

## *ECx* models

The **ECxExp** model is a basic exponential decay model, given by the equation:

The **ECxSigmoidal** model is a simple sigmoidal decay model, given by the equation:

The **ECx4param** model is a 4-parameter sigmoidal decay model, given by the equation:

The **ECxWeibull1** model is a 4-parameter sigmoidal decay model which is a slight reformulation of the Weibull1 model of Ritz et al. (2016), given by the equation:

The **ECxWeibull2** model is a 4-parameter sigmoidal decay model which is a slight reformulation of the Weibull2 model of Ritz et al. (2016), given by the equation:

## *NEC* models

The **NEC3param** model is a basic exponential decay model equivalent to **ECxexp** with the addition of the “NEC” step function. This is the original model of Fox (2010) given by the equation:

The **NEC4param** model is a 3-parameter decay model with the addition of the “NEC” step function, given by the equation:

# Alternative sigmoidal NEC model

We explored the utility of an expanded NEC model that allows a sigmoidal curve following the NEC-step point:

which has the same parameters as the NEC 3 parameter model (equation (6)), but with an additional parameter . With the exception of *A. millepora*, NEC estimates using this sigmoidal NEC model were highly unresolved, despite the model yielding a relatively good fit to the data (Fig. S1).

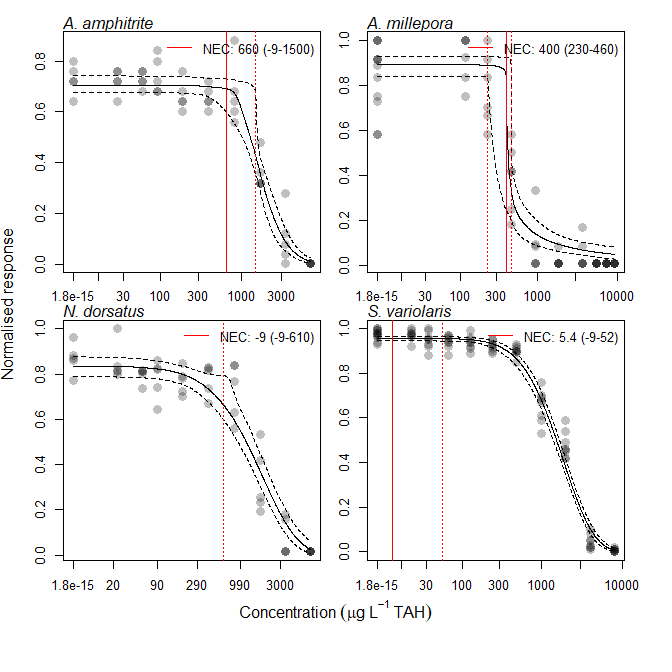


Figure S1: Concentration response relationships for the effects of 40% weathered Ichthys condensate WAF on four tropical marine species. Measured time-weighted average concentrations are expressed as µg/L Total Aromatic Hydrocarbons (TAH) on a log scale. Solid black lines are Bayesian NEC-sigmoidal beta model fits with 95% credible intervals indicated by dashed black lines. The fit is for the . Binomial response data are the proportion of successes (A. millepora, and S. variolaris); growth rate response data taking values >1 are normalised relative to the maximum value (N. dorsatus); and growth rate response data taking values <1 are modelled on the original scale (A. amphitrite). The vertical red lines indicate the estimated NEC with 95% confidence intervals (dashed lines based on posterior predictions).

# References

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