

# Miguet et al 2016 Discussion

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How do you find the most biologically relevant scale for a study? What are the components to consider and potential ways to go about it?

Miguet et al. 2016 proposes predicting the "scale of effect" using five broad categories: species traits, landscape variables, biological responses, indirect influences, and regional context. In practice, many scientists make the assumption that this scale is limited to ranges at which organisms can interact with and observe their environment. However, this assumption is not always empirically supported. One method for quantifying the scale of effect involves multi-study analysis of the environmental variable at increasingly large concentric perimeters to the biological entity followed by statistical modeling of the environmental conditions to the biological response to find the best correlation coefficient. Notably, this method works well for pinpointing scale effects, assuming moderate iterations, but lacks directionality. An alternative up-and-coming approach involves comparison of species mobility or demography traits with scale of effect. Miguet et al. 2016 outlines and evaluates 14 predictive assumptions for this approach, noting that only five show some support: a) the scale of effect is larger for larger-bodied animals; b) the scale of effect is more extreme (larger/smaller) for migratory species than non-migratory species; c) the scale of effect is smaller for species with a high reproductive rate; the spatial scale of effect depends on biological response and increased with fecundity, abundance, occurrence, and genetic diversity; the direct effect of a biological variable's weak response to an environmental variable is likely due to a single factor strongly influenced by the environmental variable and thus can be approximated as that environmental variable's scale of effect on the factor.

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Explore how this question of finding the biologically relevant scale relates to your own research questions or system. In particular, was there one hypothesis/prediction in the paper that sparked a new idea or line of thinking regarding your research? How so or why not?

The prediction that the scale of effect is more extreme (larger/smaller) for migratory species than non-migratory species is highly relevant to my research on krill. Since krill exhibit extreme daily vertical diel migrations, their abundances are highly tied to depth. However, many models only conceptualize krill in a two-dimensional (lat, lon) or three-dimensional space (lat, lon, time) due to the constraints of net data. It is easy to know where approximately you caught krill, but nearly impossible to know when the net moves from deeper to shallower layers upon pullup. My current research focuses on using automated underwater imagery and four-dimensional fine-scale spatial data to hopefully get at the question of relevant scale and appropriate model parameterization.

What advances do you think the paper suggests need to be made in regards to spatial ecology?

The paper highlights several pitfalls of spatial ecology: 1) there is little evidence to support the assumptions necessary for interpretation of species mobility or demography traits with scale of effect. This lack of information is compounded by misspecification of scales of effect, due to researchers' confounding of multiple factors, a blunder which creates average responses and obfuscates true biological correlates with specific environmental covariates. Finally, inconsistent metrics lead to disparate environmental and biological variable choices, measurements, study sites, and modelling. This discontinuity makes it difficult to compare results across studies even when considering the same species and region.

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