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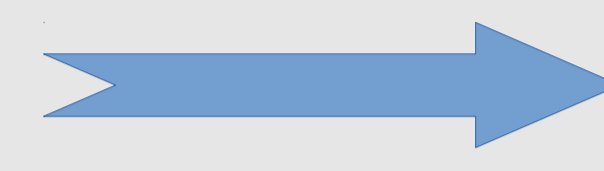
Introduction

The availability of phosphate plays an important role for the primary production in headwater streams. Primary producers such as algae represent in turn high quality food for heterotrophic organisms and thus can alter the community structure of benthic invertebrates. Present studies mainly focus on the effects of phosphate concentrations near the saturation limit. There is a clear lack of studies investigating the effects of natural differences in phosphate availability as well as regarding more than one trophic level.

Hypotheses & Methods

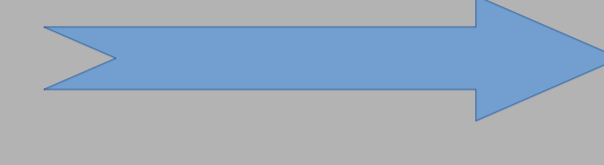
With increasing phosphate concentrations we expect:

(1) Increased niche overlap and niche width within the functional group of grazers



Bayesian calculation of standard ellipse area (SEA) and overlap (Jackson et al. 2011)

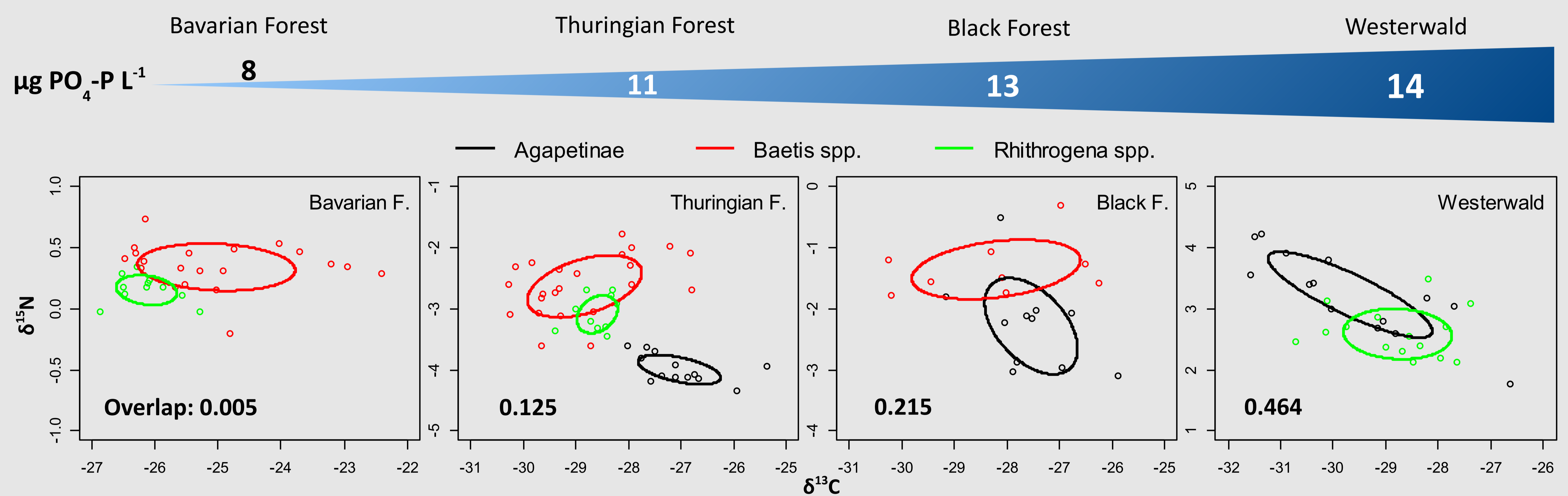
(2) Increased trophic diversity regarding the entire benthic community



Bayesian calculation of community-wide metrics (Layman et al. 2007)

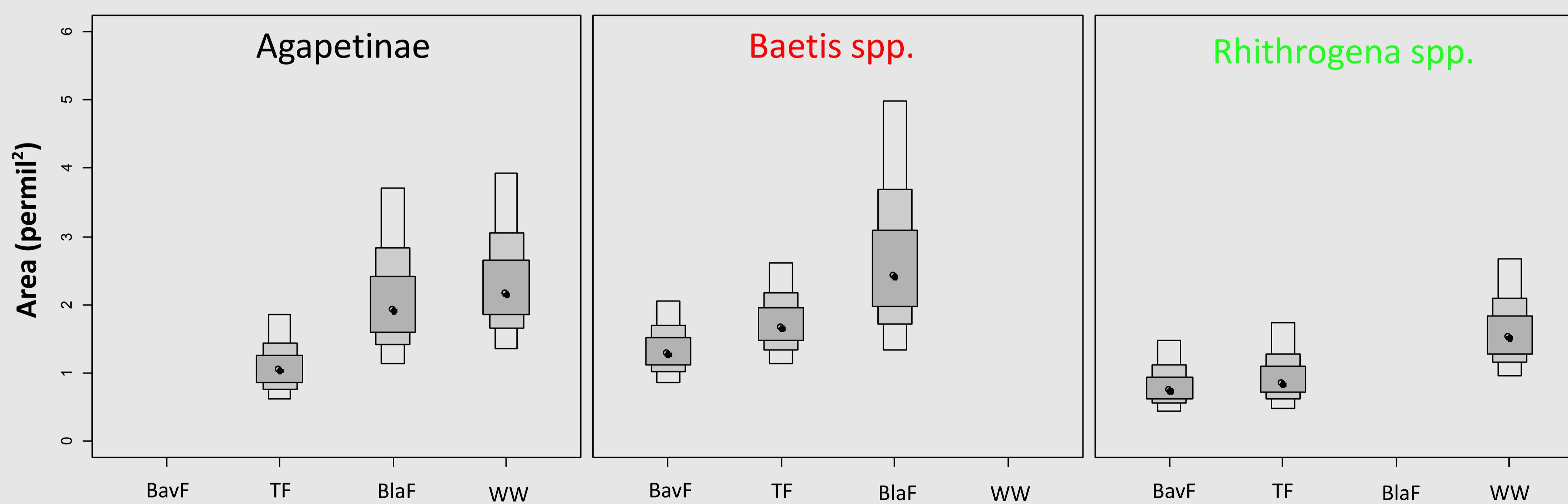
Stable isotope analysis

Geogenic phosphate gradient



Results

Increased niche overlap (SEA) of benthic grazers with higher phosphate availability



Tendency of increasing niche width, but no significant differences along the gradient

Fig.: Bayesian estimate of niche width (densityplot, black dots represent the mode, boxes show the the 50%, 75% and 95% confidence intervals from dark to light grey)

	Bavarian Forest	Thuringian Forest	Black Forest	Westerwald
$\delta^{15}\text{N}$ -Range	5.4	5.9	6.7	6.7
$\delta^{13}\text{C}$ -Range	6.1	4.7	6.5	4.7
Convex hull area	18.4	18.2	22.6	19.3

No consistent increase of trophic diversity with higher phosphate availability

Conclusion

Even low phosphate concentrations can influence the structure of benthic invertebrate communities. Regarding the functional group of grazers there is an increasing overlap of trophic niches with higher phosphate availability, whereas the phosphate gradient is not reflected on a community-wide scale.

References

- (1) Jackson A. L., Inger R., Parnell A. C. & S. Bearhop (2011): Comparing isotopic niche widths among and within communities: SIBER – Stable Isotope Bayesian Ellipses in R. *J. o. Animal Ecology*, **80**, 595-602.
 (2) Layman, C.A., Arrington, D.A., Montana, C.G. & Post, D.M. (2007a) Can stable isotope ratios provide for community-wide measures of trophic structure? *Ecology*, **88**, 42–48.

