MAR estimates[1]

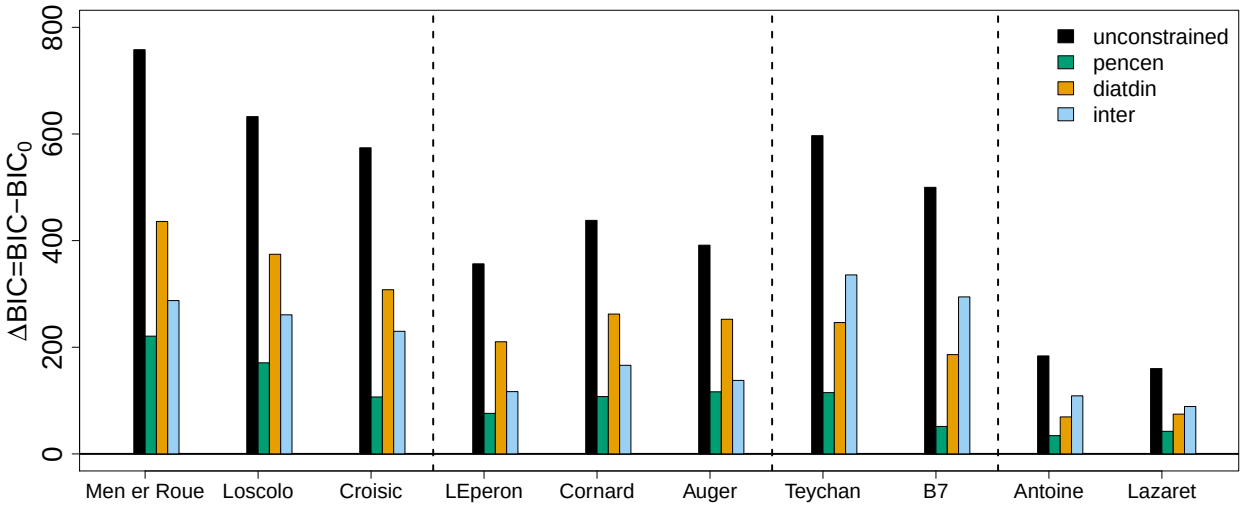

Figure 1: Comparison of BIC with different interaction matrices, compared to the null model (diagonal interaction matrix), for four different sites separated by dashed lines (Brittany, Marennes-Oléron, Arcachon Mediterranean Sea) and 10 different subsites. As model structures (length of the times series taken into account) are different between sites and subsites, groups of bars should not be compared.

[1]We should note that NEE does not like barplot...

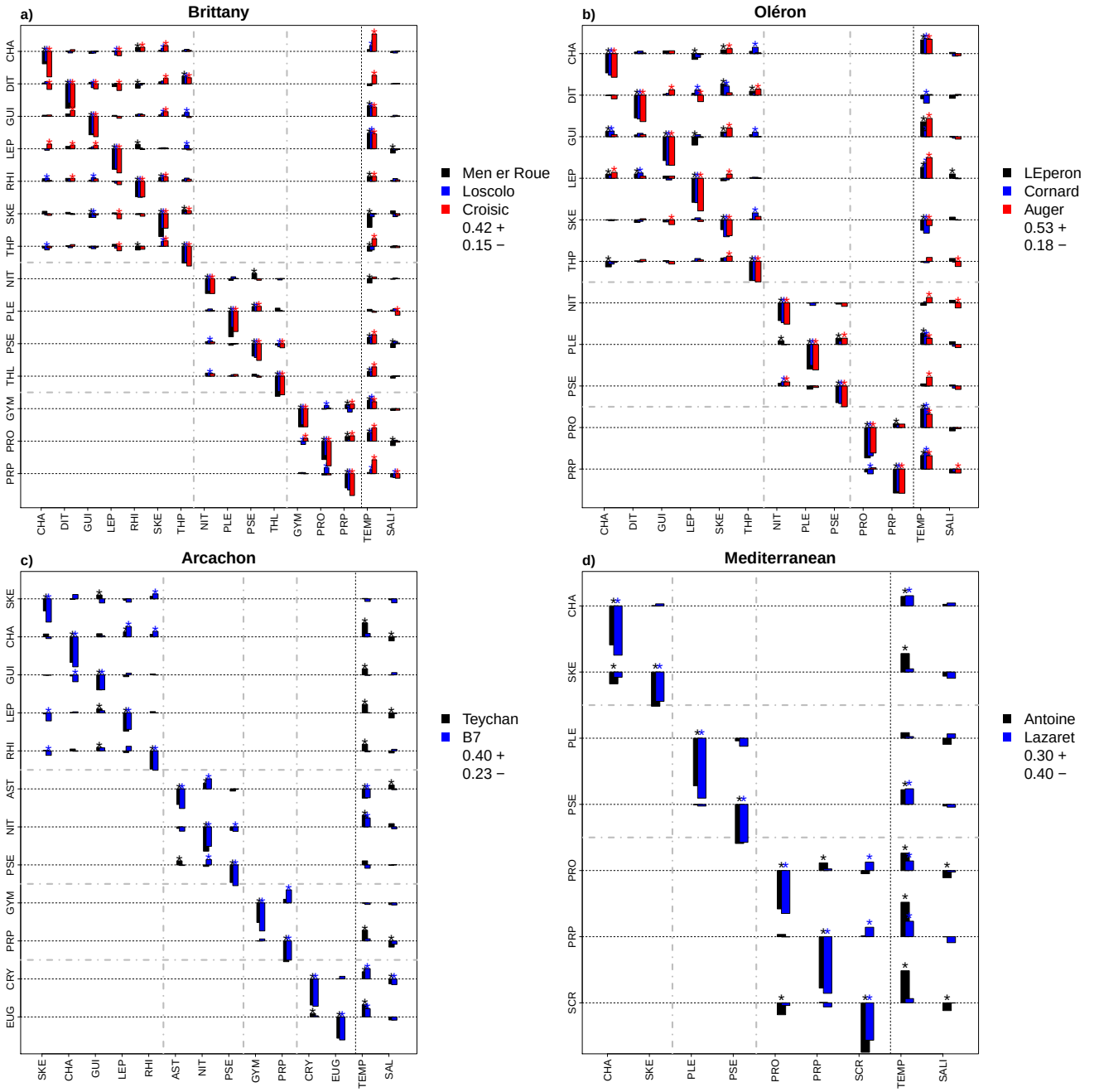

Figure 2: Coefficients of the pennate vs. centric MAR model for species which are present at the 10 sampling subsites, using temperature and salinity as covariates. The ratio of positive and negative interactions which have the same signs for all subsites in one site (not considering diagonal values, that is intragroup interactions) is shown below each legend.

Matrix analysis

Hereafter, we consider the 10 interaction matrices (**B-I**) estimated in the different subsites as 10 repetitions of possible community matrices. Both the unconstrained (full) and the pennate/centric matrices are analyzed, with a focus on the latter, which yields the lower BIC (analyses for the unconstrained matrix can be found in the graph folder). In both cases, all coefficients are taken into account (as opposed to the significant ones only). For unconstrained matrices,there are between 21% and 39% of significant coefficients, while for pencen matrices, they represent between 35% and 59% of estimated interactions (13% to 21% of all interactions). We characterize the interaction matrices with usual quantitative metrics and search for patterns in the strength of the coefficients.

Usual network metrics

Local stability A first proxy of the local stability of the community can be found in the eigenvalues of the interaction matrix. We present the maximum modulus of the eigenvalues of each matrix in Table 1 and compare them to the proportion of strictly positive interactions in Fig. 3. No clear relation can be found in the unconstrained matrices but there seems to be a decreasing trend in stability with the increase in the proportion of positive interactions.

	Unconstrained (eig)	% positive	Pennate/centric (eig)	% positive
Men er Roue	0.57	57	0.52	57
Loscolo	0.53	56	0.42	50
Croisic	0.65	52	0.50	49
L'Eperon	0.58	59	0.44	53
Cornard	0.49	51	0.46	47
Auger	0.57	55	0.51	55
Teychan	0.59	55	0.46	45
B7	0.64	50	0.57	38
Antoine	0.55	47	0.55	30
Lazaret	0.64	37	0.61	24

Table 1: Maximum modulus of the interaction matrix eigenvalues and proportion of strictly positive interactions in the interaction matrices estimated in different sites, with a full matrix or a matrix only allowing interactions within pennate and centric diatom groups, not between them.

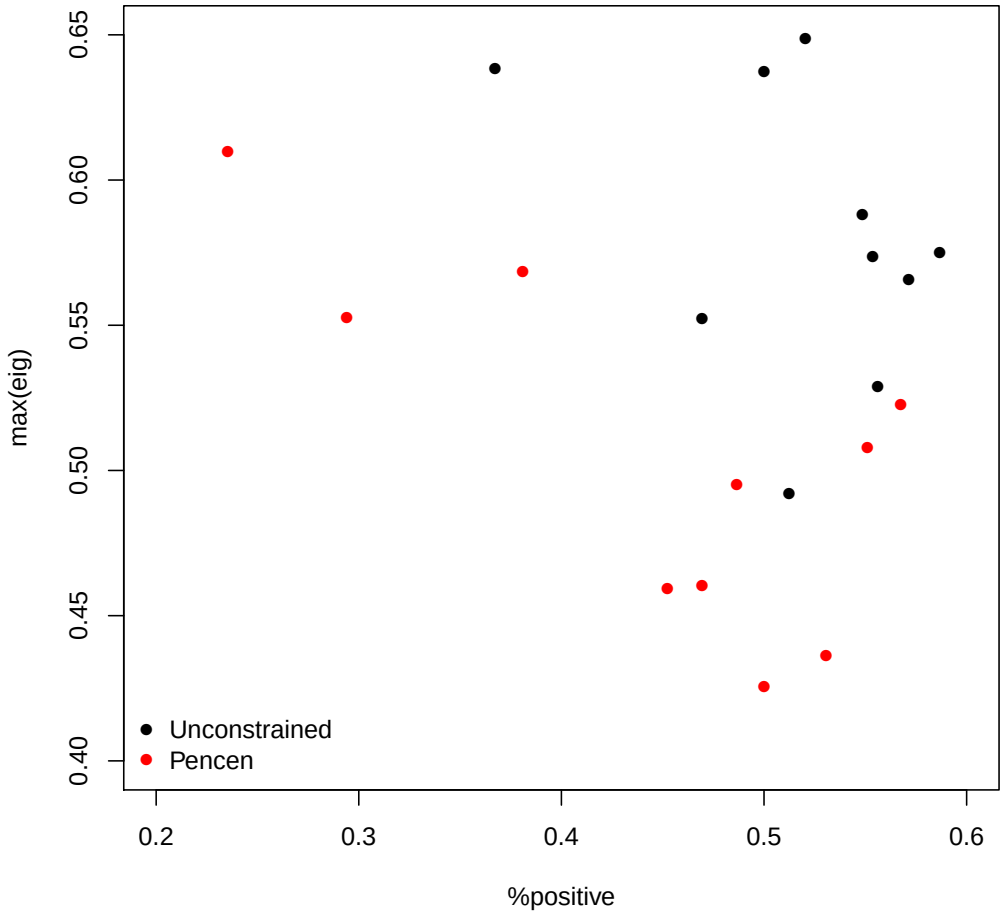

Figure 3: Maximum modulus of the interaction matrix eigenvalues as a function of their proportion of strictly positive interactions. Unconstrained (full) and pennate/centric matrices are shown in black and red, respectively.

Link properties The usual definition of connectance does not fit our case as we take the same number of links into account in the unconstrained (C=1) and the pencen matrix (0.29<C<0.41, depending on the site but stable among subsites). However, weighted connectance [van Altena et al., 2016] and weighted linkage density [Bersier et al., 2002] use the information about the strength of the interactions in the matrices.

These quantitative metrics were developped for competitive or trophic only matrices, in which interactions all bear the same sign and represent the same phenomenon (competition or feeding rate, for example). They only apply to positive values of coefficients. Our matrices include apparent mutualism (+/+, between 19% and 35% of estimated interactions in the pencen matrix, with the notable exception of Lazaret where no such interaction can be found), facilitation-commensalism (+/-, 12-57%) and antagonism (-/-, 22-65%) according to Stachowicz [2001]'s classification. We thus decided to compute the same metrics on either the absolue values of all interactions, only the positive and only the negative values of each matrix.

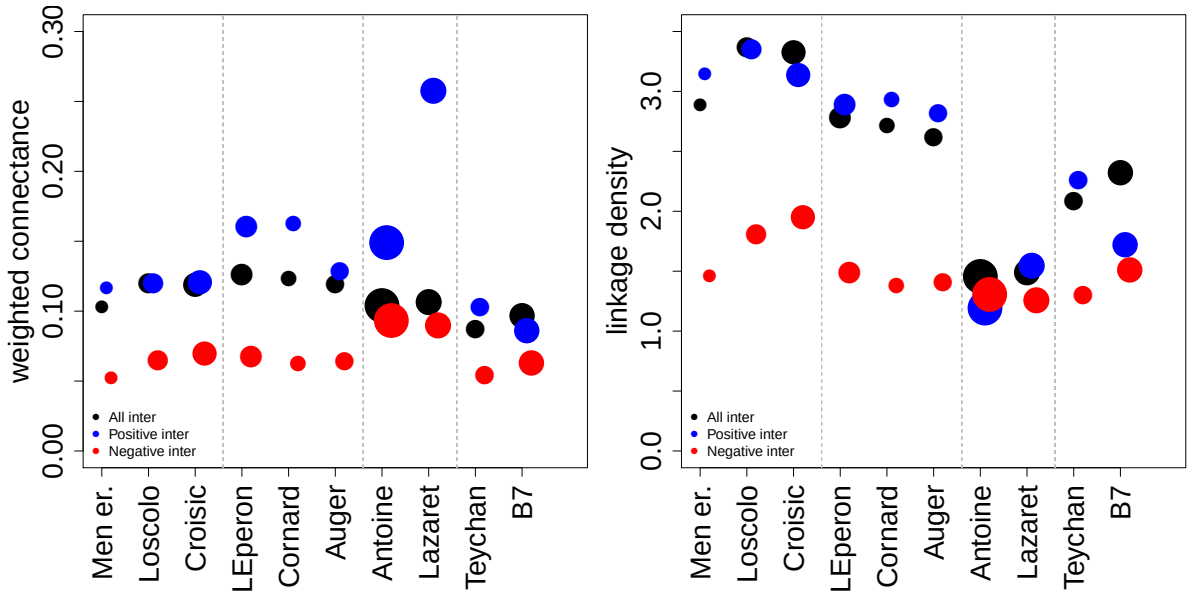

Figure 4: Weighted connectance and linkage density of the pennate/centric interaction matrices estimated in 10 different subsites, differentiating positive and negative interactions. Dot sizes increase with the proportion of coefficients that are deemed significant at the 5% threshold.

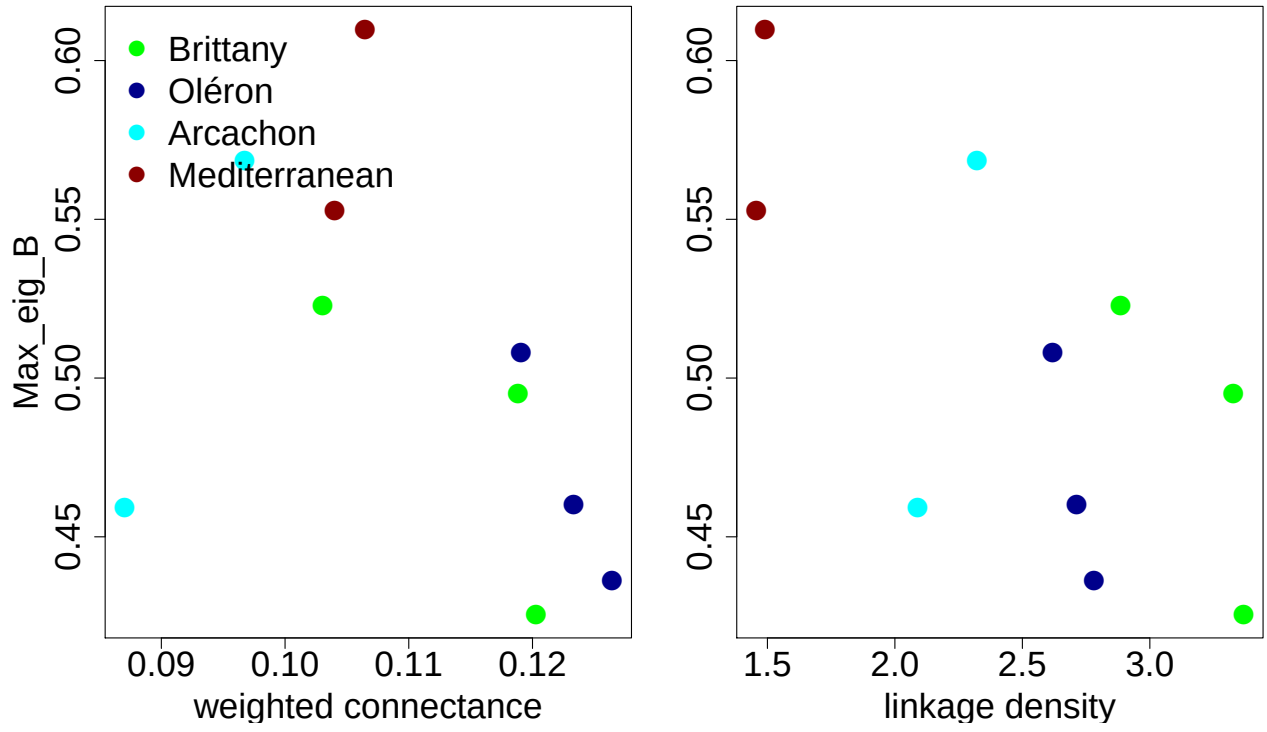

Figure 5: Stability as a function of weighted connectance and linkage density in pennate/centric matrices in 10 different subsites.

Covariance between self-regulation and competition with other groups

To examine a possible covariation of intra and inter-genus competition, we computed several indicators of inter-group competition. For each genus i, an index of vulnerability (computed on $b_{i.}$) and generality (computed on $b_{.i}$) can be computed. For these two indices, we computed the sum and average of raw and absolute values of the

interaction coefficients.

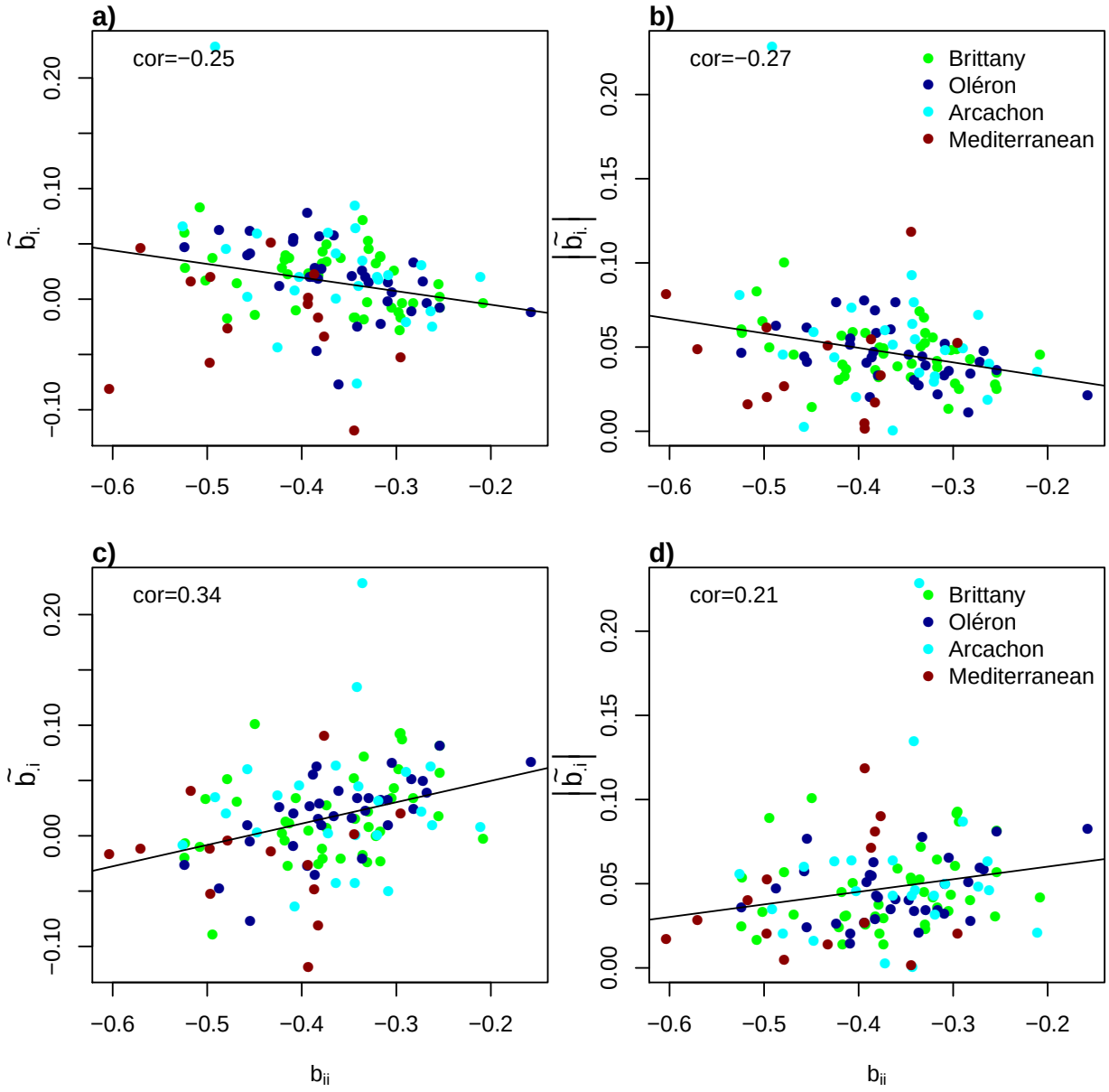

Figure 6: Mean raw (left, a,c) and absolute (right, b, d) vulnerability (top, a-b) and generality (bottom, c-d) as a function of self-regulation strength, for a pennate-centric interaction matrix excluding the values of the interactions forced to 0.

The more self-regulated a species is, the stronger the interactions of this species are, but the more it tends to engage in negative interactions.

For a given species, self-regulation is highly variable depending on the site.

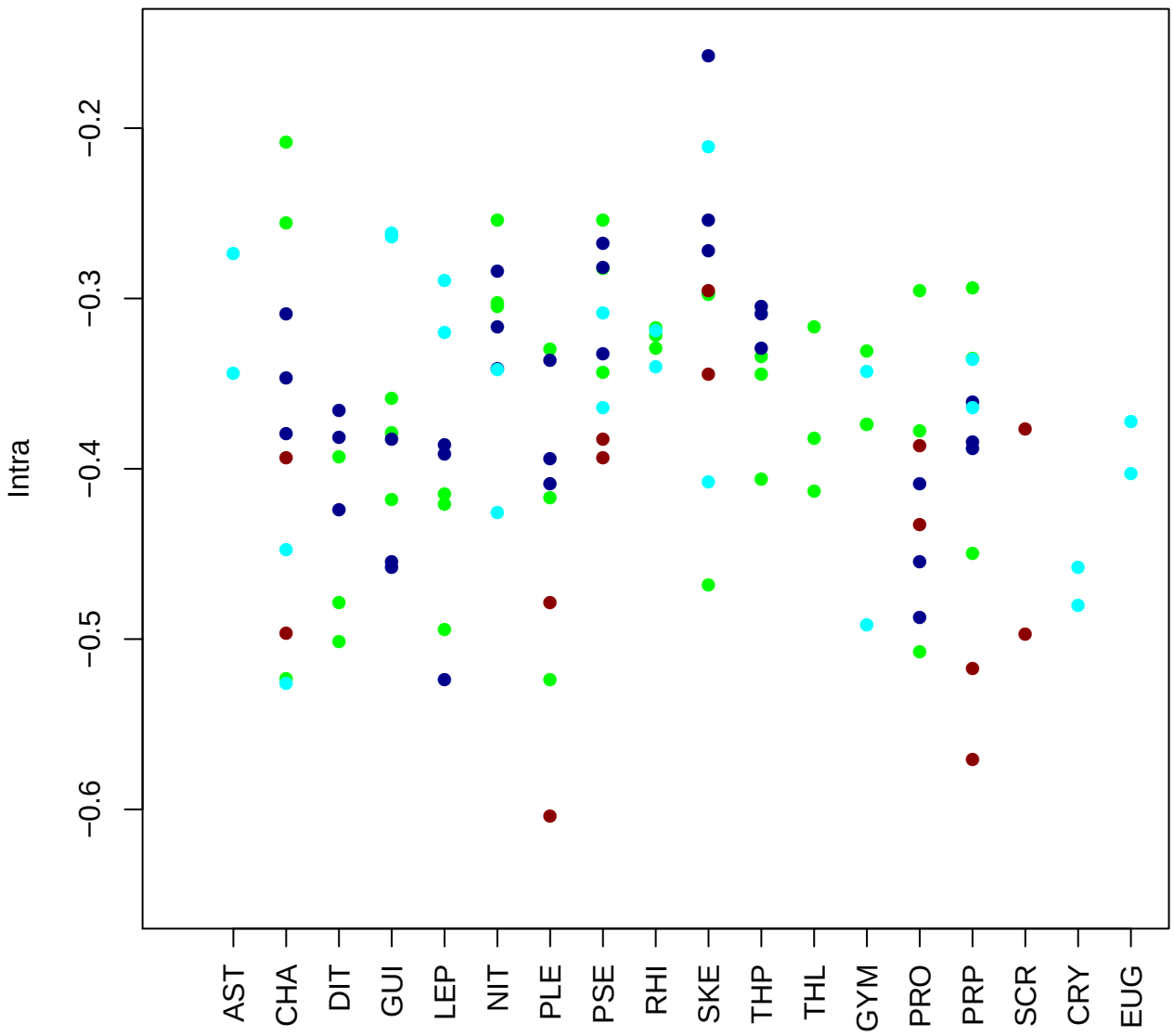

Figure 7: Intra-genus competition for each species in different sites for a pennate/centric interaction matrix

Discussed, not done (yet)

Finally, we also wanted to consider the variance between growth rate and intragroup competition (b_{ii} vs. $\bar{c_{i.}}$, or only consider eigenvalues? Would it make sense?)

In addition to averaging, we can consider the standard deviation of intergroup coefficients and environmental effects.

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