**Online Appendix:**

Appendix A: A trait-based assembly model.

We consider a generalised version of the Loeuille and Loreau (2005) model developed by Brännström et al. (2011) which depicts the *per capita population change rate* as a function of population growth derived from prey consumption minus mortality from senescence, predation and interference competition:



where *λ* is the conversion efficiency for the consumptive interactions. The per-capita predation rate of species *i* preying on species *j* is set to be trait-mediated, , where *N*(*a*, *b*) is the probability density function of normal distribution with mean *a* and standard deviation *b*,  the trait difference of species *i* and *j*, *ri*-*rj* (considering the logarithm of body size relative to that of the autotroph). The coefficients *μ* and *σγ* represent the optimal trait ratio of predator to prey and the dietary breadth of the predator. The natural mortality is also assumed to be trait-mediated, *Di* = *d*0exp(-*ri*/4) (Peters, 1983). The intensity of interference competition is at its maximum when the two competing species have identical traits, *Cij* = *k*0*N*(∆*rij*, *σk*). In addition, the dynamics of the autotroph (resource base) is governed by, , where *g* is the intrinsic population growth rate (see detail model description in Brännström et al. 2011). The resources *n*0 are disturbed by adding a periodic perturbation (sine form with pulse 10 and magnitude 100).