Plan 1

§1. The BEF field is integrative in several ways : it bridges the gap between subdisciplines of ecology, and Community ecology focuses on the causes of species diversity at a given spatial scale, whereas ecosystem ecology is interested in describing processes (ecosystem state and rates). The BEF field bridges the gap between these two disciplines by shifting the perspective: species diversity is seen as a cause of ecosystem functioning. The number of species seems to matter, *and most of the explanations rely on species functional characteristics (only the temporal stability of ecosystem flux like productivity can be enhanced by species diversity without requiring species to be functionally different).*

*“However”:* still debate/a poor understanding of how different species affect BEF relationships. Are they driven by dominant species?

*“However 2”:* the number of species is not *per se* a determinant. Depends on the functional characteristics of the species.

*“However 3 “:* Species vary in many attributes : their abundance, their traits... all of which are likely to modulate their effect on ecosystem functioning. To gain a mechanistic understanding...

$2. Mechanisms. Selection / Complementarity. Traits.

*“However”:* Even a given species can have different effects depending on the environment.

$3. Environment. The number of species coexisting is affected by the availability of resources. Spatial heterogeneity affects the shape of BEF curves. BEF relationships thus seem to depend on environmental variables at large spatial scales as well as locally.

*However:*

$4. Functional originality

$5. Model.

Plan 2

$1. Functional ecology. Traits. Response and effect. Bridges the gap between two domains. How they can affect ecosystem functioning. Taxonomic diversity of species has an effect, and is linked to functional diversity in most of the cases. Mechanistic understanding.

$2. Abundance has an effect. Mass ratio hyp (lire le papier d’Eric sur la question). The effect of rare species is discussed. Functional originality. Has not been tested much.

$3. BEF expected to vary with the environment. Does the role of functional originality vary with the environment?

$4. Need to test the effect of the removal of original species, in an environmental gradient. Manipulation : too much, and too much time. Exploratory role. Advantages of the model:

- “validated” for long-term composition and short-term productivity (the two characteristics that we need)

- Initially indpdt from BEF – but used to study it afterwards, and can generate complementarity effects. Interactions (compet for light) are explicit

- traits are explicitely encoded, and links have been done with trait databases (realism) + mechanistic understanding of the traits.

- calibrated in many sites, on an envt gradient.

$5. Quickly what we did: generate biodiversity erosion scenarios, targeting functionally original species first or not. See how it affects productivity, in these different sites.

Plan 3

Attention : termes univoques à choisir. Abudant/scarce. Functionally redundant (or common ?)/distinct (and avoid using functionally original ? Or distinct is an operational proxy for original?) Commonness/distinctiveness of traits.

*$1. The importance of rarity in ecology, from abundance scarcity to trait originality.*

Rarity is a hot topic in ecology, but the rarity of functions has not been much studied, although it has a potentially strong effect on ecosystem functioning.

*$2. BEF, evidence and mechanistic explanations.*

* However, the importance of functional originality for ecosystem functioning is poorly known.
* There is now confidence in the BEF field that the number of species matter. Mostly small-scale experiments. Measures of ecosystem rates or states (notam. Productivity).
* These effects can be decomposed into complementarity and selection effects (define them).
* Link to traits (papiers Garnier, Mouillot, etc...). When a species has a higher biomass than the others, it is termed “dominant species”. These species are expected to be important for ecosystem functioning. More specifically, their *functional effect traits* should affect ecosystem processes more than those of the less abundant species (*this* is the MRH). If species that are dominant (in abundance) also have a higher yield in monoculture, there is selection effect, and if it can be predicted from their effect traits, the MRH could explain selection effect (penser au papier de Cadotte : selection and complementary effects can be linked to traits.). Complementarity: due to niche partitioning or positive interactions. They all require differences in traits.

*$3. What effects can we expect from trait originality?*

More specifically, we can expect scarcity and functional distinctiveness to be correlated (Mouillot, etc). In this case, the effect of their traits should be weak (according to the MRH) – but are we sure that this correlation holds across environments? (Relire papier de David). Alternatively, if distinct species are abundant, they are expected to have a stronger effect (still using the MRH? Violle et al 2017).

And since these species are functionally original, they might be important for ecosystem function as they display traits that others lack (not mention the complementarity effect, but the mechanisms used to explain it: niche complementarity and positive species interactions. At least for the first, being functionally distinct is likely to matter).

(Why it should have a strong effect.) BEF studies, confidence (consensus) that has an effect on ecosystem functioning. Mechanistic understanding: selection (productive species...), complementarity. AND link it with the traits **a) BEF explained by traits** (papiers de Garnier, Mouillot, etc.), et **b) montrer qu’on peut essayer de relier ça à selection/cpltarity, notamment via mass ratio** (cf. le papier de Cadotte, plus pourquoi pas le Kraft, 2015). Complementarity requires difference. What about the most different species in a community? (Et ici le lien peut être fait avec les papiers de Mouillot, sur les espèces fonctionnellement rares.

Puis aller dans les details : Functionally rare sp can either be abundant (on a parlé de la mass ratio hypothesis), and their removal should affect BEF strongly, or be scarce, and have a lesser effect, plutôt sur la complémentarité (peut-être ne pas trop rentrer dans le detail ici, car on ne travaille pas sur les effets de selection/complémentarité dans le papier. Ou alors il faut se lancer dans des modèles statistiques sympa. **Par contre**, utiliser Violle et al. Pour bien montrer qu’il y a plusieurs formes de rareté, notamment en lien avec l’abondance, et que cette interaction avec l’abondance est sensée avoir un effet important. (et ce que je pourrais faire, c’est ne prendre que les espèces qui persistent dans un site quand on met tout le monde, et refaire des simul en les retirant par abondance décroissante… ça me fait onze simul à relancer, pour les onze sites)

*$4. BEF: context-dependent. Functional originality’s effects should depend on the environment.*

However, the effect of species are dependent on the environment.

*$5. Test it all: ForCEEPS*

*$6. What we did. Although correlative studies (maire, murgier...), our study is the first, to our knowledge, to manipulate fct rarity (numerically).*

Rque : dire quelque-part que l’ANPP est un bottleneck pour niveaux trophiques supérieurs, donc fonction écosystémique importante ? Mais est-ce que c’est valable en forêt ?

ATTENTION : si je parle aussi de stabilité temporelle, il faut que je change un peu mon intro. Notamment, celle-ci ne fait pas nécessairement appel aux traits (cf. papier de… Hillebrand ?). A ne pas oublier pour la discussion !