

## Notes from Scoping Meetings of Response Diversity Network [04 Oct 2022]

**Attended:** Sam Ross, Owen Petchey, Frank Pennekamp, Shyamolina Ghosh, Fred Windsor, Frederik De Laender, Akira Mori, Dave Armitage, Anna Eklöf, Andrew Beckerman, Masayuki Ushio, Laura Antão, Elina Kaarlejärvi, Thomas Johnson, Pete Manning, Pol Capdevila, Naohiro Ishii, Vasilis Dakos, Sofia van Moorsel, Myrna Barjau Pérez-Milicua, Qiang Yang, Takehiro Sasaki, Francesco Polazzo, Thomas Malpas, Penelope Blyth, Hannah White, Lucie Kuczynski, Helmut Hillebrand, Hana Mayall, Tad Dallas, Mike Fowler, Laura Dee, Alain Danet, Meghan Hayden, Claire Jacquet, Ceres Barros, Rachael Winfree, Karen Abbott, Maja Ilić, Nelson Valdivia, Dylan Craven, Erica Newman, Shane Blowes, Aiko Iwasaki

### Is it worthwhile pursuing a Network?

- Yes, particularly useful for coordinating meta-analyses and other synthesis projects.
- Yes, lots of options to collaboratively explore RD in time series (e.g., BioTIME).
- Yes, possibly all the pieces already there (e.g., suitable time series) so might just be a case of putting things together from existing data on diversity, env. responses, stability etc.
- Yes, worthwhile and needed discussion – particularly to overcome some longstanding challenges (e.g., tautology of RD measures).
- Yes, worthwhile and exciting. Particularly useful for coordinating study-specific response variables (to get at more general understanding).
- Yes, networks are almost always a great thing in ecology!
- Yes, seems productive, and great to bring such a mix of theoreticians and empiricists.
- Yes, large group is a great opportunity to agree on e.g., definitions as a community.

### What should we prioritise?

#### *Procedural details*

- **Network should have regular, structured interactions.**
- Should provide an opportunity for people to get to know each other in smaller groups / on an individual basis (networks often more effective with subgroups and when everyone knows everyone else).
- Some support for a small core group to act as a “steering committee”.

#### *Universal indicator*

- Can we generalise RD to identify a universal indicator of stability etc.? i.e., which traits might best predict environmental responses?
- Defining the traits we should/need to be measuring (or not!) will be important.
- When summarizing which traits predict community responses to change most consistently, variation in these traits might not be the same as what stabilises function (maybe more careful thought and theory needed).
- To identify key response traits, maybe a table with the columns of: taxa, driver, trait, data availability, would be a good starting point (lots of combinations). Certain combinations likely already well worked out (and maybe published as meta-analyses, e.g., that SLA predicts plant response to nitrogen), but for others it could be largely unknown. Continuing from this table, a project that compiled data across studies, where data is available, to find the traits that best predict response would be powerful (for understanding biodiversity change in general too) – maybe a good working group proposal?
- Physiology as underlying mechanism behind e.g., RD to temperature, should be interesting avenue – could link with ecophysiologicalists.

#### *Definitions/assumptions*

- Important to differentiate v clearly between RD and FD (to prevent mix-ups). RD as a component of FD (do species contribute equally to RD and FD?), both likely depend on community composition.
- RD framework works on the idea that responses won't collapse a system – if divergence of responses too high, can cause extinctions etc. and collapse system (interesting to test the limits of RD!).
- Insurance effect assumes asymptotic stability – relaxing this assumption (allowing chaotic dynamics, nonlinear species interactions, etc.) might help things be less tautological (nonlinear environmental responses).

### *Methods development*

- Does RD need time series? No, can be measured across e.g., spatial/disturbance gradients. But if using time series, should be suitable length, resolution, etc.
- Risk for tautology – if we define RD as being a metric that best predicts stability, then how can we then test its mechanistic link with stability? Could just be proving something self-evident – this should be a core issue to revisit.
- Mark Genung working on manuscript using GAMs to think about RD (SR to contact).
- Benchmarking project – need to be clear what we're benchmarking new methods against, how they relate to e.g., stability, functioning, etc.
- How can modelling help in benchmarking project? Should be good opportunities there for methods development.
- Would a multidimensional metric of RD be worthwhile? What would it provide over a unidimensional measure?
- Important to consider cases where species respond differently but also contribute differently to functioning (so will affect aggregate ecosystem functioning etc. differently if lost) – simulation studies should be useful here.

### **Challenges to overcome/interesting avenues**

#### *Species interactions*

- How to include interactions in RD framework – are they important for RD?
- Functional response could be helpful here – not yet exploited enough in RD framework.
- Community structure more broadly might be a useful proxy for interactions.
- Considering mutualistic vs antagonistic interactions should be interesting and could help bridge gaps between RD and other related subfields/concepts.

#### *(A)synchrony*

- Can measure (a)synchrony and see how it relates to RD. Particularly interesting when thinking about synchrony within vs across trophic levels, how it relates to portfolio effects, and importance of rescue effects, etc.

### **Funding options**

- NSF research coordination grants in USA
- LTER synthesis grants in USA – Is it possible to connect this with other LTER projects elsewhere (e.g., Chile)?
- NCEAS funding in USA
- Macrosystems and NEON-enabled science call
- Ecological forecasting initiative
- iDiv
- Royal Society for workshops/meetings in UK (deadline: 5 April 2023) – then has special issue in Phil Transactions
- BES Symposium (deadline: Feb 2023)