Can we use metabarcoding data for food web studies of invertebrate communities or

What is learned from these types of data that complements/revises/boosts other methods?

Challenge: Invertebrate communities have many cryptic interactions, making it challenging to build interaction data based on real observations. Metabarcoding diet could be a solution in these systems to otherwise inferred or unknown data.

There is a dearth of terrestrial food webs in the literature, due to many historic limitations, one including lack of an ability to capture interactions for many consumers who are invertebrates. This also has the potential to re-evaluate and disaggregate data for aquatic food webs with invertebrate consumers.

Werewolf: If we use metabarcoding data to build food webs and interaction networks, we want to know that it is giving us information comparable to or better than inferred data.

Silver Bullet: We look at metabarcoding data of generalist predator species at the individual level and show some examples of comparable or better than inferred data.

**Analyses compared to online food webs:**

1. Per species links comparison between published and observed

Added bonus of being able to build confidence of capturing full links based on individual accumulations of new links (accumulation curves).

1. Appropriate food webs: rmangal: hines\_et\_al\_2019, Dryad: Laigle et al. 2017, Rohr et al. 2014, Ludwig et al. 2019, Powell et al. 2017, Falcon-Brindis et al. 2019
2. Molecular food webs: Dryad: Vesterinen et al. 2016, Staudacher et al. 2018, Eitzinger et al. 2017, Eitzinger et al. 2018, Verschut et al. 2018
3. Interaction strength distributions comparison between published and observed

Being able to actually measure this based on consumption, rather than co-occurrence (new Gravel paper as good citation here). – is there evidence in the literature of interaction strength methods, or food webs of similar species with interaction strengths reported? Is observed interaction strength linked to prey density, in which case, using co-occurrence could be valid approach?

1. Ludwig et al. 2019, Powell et al. 2017, Falcon-Brindis et al. 2019,
2. Molecular food webs: Dryad: Vesterinen et al. 2016, Staudacher et al. 2018, Eitzinger et al. 2017, Eitzinger et al. 2018, maybe Verschut et al. 2018
3. Predator-prey body size ratios comparison between published and observed.

What does metabarcoding data give us that is new here? Think on that… Probably the individual-level data here, rather than an accumulation based on average body size of predator. Next steps would be to think about how to capture the body size of the actually consumed prey… Individual pred-prey body size vs. population pred-prey body size

1. Appropriate food webs: Dryad: Laigle et al. 2017, Rohr et al. 2014, Ludwig et al. 2019, maybe Powell et al. 2017, maybe Falcon-Brindis et al. 2019
2. Molecular food webs: Dryad: maybe Vesterinen et al. 2016, maybe: Staudacher et al. 2018, Eitzinger et al. 2017, Eitzinger et al. 2018 maybe: Verschut et al. 2018
3. Ontogenetic diet shifts within species (added nodes) – being able to measure them in real time

Lack of ontogeny in our dataset, think about how this could either be due to real lack of ontogeny shifts or whether it could be due to lack of data in size classes (maybe iNEXT accumulations based on arbitrary size classes of predators and/or core prey within the whole species comparisions, rather than all prey comparisons). Give a prescriptive of how much you would have to collect to get at ontogeny? Or?

1. Molecular food webs: Dryad: Eitzinger et al. 2017, maybe: Eitzinger et al. 2018, maybe Verschut et al. 2018
2. Functional traits of predators

Is diet diversity, body size, or composition dependent on predator functional traits? (eg feeding mode?) (could just be something to parameterize the rest of the webs with)

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2. Molecular food webs: Dryad: maybe Vesterinen et al. 2016, maybe Staudacher et al. 2018, maybe: Eitzinger et al. 2017, Eitzinger et al. 2018, maybe Verschut et al. 2018
3. Where else could we use this?

Taxonomic coverage of our food web in NCBI and BOLD

Taxonomic coverage of other invertebrate food webs in NCBI and BOLD

**Published food web data from:**

1. Rmangal – subset networks with terrestrial invertebrate predation interactions
   1. Only one really good food web in this database
2. Web of Life Database – subset networks with terrestrial invertebrate predation interactions (update: NONE)
3. NCEAS Interaction Database (if it is up and working) – subset networks with terrestrial invertebrate predation interactions (a few, but not in other databases)
4. [Maybe thinking about getting ALL interaction types from rglobi somehow? Would this help? Maybe would help with the idea of “observed vs. possible”? Or?]
5. Dryad datasets – search with keywords
   1. 13 datasets that seem workable without substantial re-analyses (e.g. have some sort of interaction matrix, not including just raw sequence data)
      1. Some of these are molecular diet data too! (6/13). Interesting potential extensions with looking at diet method and outcomes.
   2. June 24, 2020, “food web”: 463 papers
   3. June 24, 2020, “interaction network”: 553 papers
   4. June 24, 2020, “predator prey interactions”: 520 papers,
   5. July 1, 2020, “diet analysis insect”, “diet analysis spider”
   6. July 2, 2020, “gut content analysis”.