**Scott**

I’m very happy to see this, and will comment in the next week or so.

 To help me in thinking about it, some questions about the data used –

* Does this use only the “beta diversity” project data (as exemplified in Craft et al 2010)?
* I don’t understand the two data sets from Ohu, is this the “beta diversity sampling” plus additional sampling from other years?
* When were the Lep data extracted from the Nagada database for analysis?  I’ve been working with Phil to update Lep ids in the Nagada database, especially incorporating ongoing DNA barcoding results (I keep Lep ids up to date in BOLD, because I have access to do it directly, but the Nagada database has had some challenges with staying up to date over the years)?
* Thinking about methods and potential bias, are there gaps in coverage of Hymenoptera identifications?  If so, they should be mentioned.  I know we had troubles finding expertise, and I don’t know how consistently the Hymenoptera were DNA barcoded.

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Scott porad reaguje neuveritelne rychle, to je super, urcite mu podekuj za "kind and quick answer". Predbezne k jeho otazkam jako navrhy, co bys mohl odpovedet:

1) Yes, but we add the parasitoid layer. (myslim, ze to tak je, ze to neni kombinovane s zadnyma dalsima datasetama, ze?)

2) It is just the beta diversity sampling. Ohu was sampled twice as part of that. (napis mu vic detailu z metodiky - bylo to sampling back to back?, myslim, ze jo)

3) to vis lip sam

4) No major gaps, we got expertise for all parasitoid groups and also barcoded X% of the parasitoid samples

Scott:

With regard to data sources, maybe some simple statement would help along these lines –

The core data come from a major sampling campaign across eight sites between year and year (Novotny et al 2007, Craft et al 2010), but in order to provide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ we supplemented the data with additional sampling from year to year at one of the sites, Ohu (citations).

Now I remember that I partially updated a list of Leps for you, and I think I sent that part to you, but then I got distracted by other projects.  I am happy to return to that if you send me the current list, BUT we need to coordinate with Phil and the master database, because he and I have also been making updates.

We have been most active in cleaning Geometridae, to support Pagi’s transect papers.  Not much change in species concepts, but many names updated because of parallel sequencing of type specimens.  The Choreutidae need to be checked – the species concepts in the genus Choreutis remain fairly clean, but the species concepts in the genus Brenthia are messy and they may be relatively host specific – Jadranka Rota continues to work (slowly) on them and we can check with her.  I’m working with John Brown now on a taxonomic revision of the tortricid genus Statherotis, which includes lots of new species, although they pretty much align with the existing BINs.  If the BIN species concepts had been translated into the Nagada database, then the species concepts are good, but they may not have all been updated.

Did Mike Sharkey identifications on Braconidae get incorporated into the data you have?  He returned many specimens to Smithsonian when he retired and moved (although he is still working on Costa Rica species).  Unfortunately the specimens got put into the main collection instead of being returned to me, and we only recently figured this out.  I have been meaning to extract the data to make sure we have all the identifications, because Mike does not remember if he reported them to anyone or not!

I have barcoded some Tachinidae and a few Hymenoptera in the post-pandemic period, but I think they are all from other projects, like the Ficus rare species project.  You have access to all of them in BOLD, I think.

Martin –

Excellent study and very interesting conclusions.  I am very glad to see all these parasitoid data finally being well used!

I have added a few “track changes” edits and comments to the same copy.  Here are some more general suggestions and questions, in no particular order.

For PNAS or similar journal, need find a balance between addressing specialist readers, and attracting the interested non-specialist.  I think the first few paragraphs need say something about the sampling system in PNG, to grab the interest of the reader with the fact that this was huge sampling effort in an exotic place, etc.  Presently the reader needs to read 300 lines to get to most of this.  For example, compare the first paragraphs of the Craft et al 2010 PNAS paper, including the fact that the map is on the second page.  I also think some more specialized terms need definition or references.  Rewiring is not linked to recent literature?  I have no idea what a “concrete parasitoid” is, and a google search turned up no uses of the term.

I think the Pereira Martins study is so different from ours as to be irrelevant.  They studied internal flower head feeding insects in only one plant family in cerrado, which is seasonal savanna habitat with many ecological specializations.  Quite different from the range of free-living caterpillars and hosts that we studied, especially because the parasitoids would presumably have to be quite specialized to even find their internally-feeding hosts.  I also worry about the quality of their parasitoid identifications, which could have caused considerable under-estimation of diversity. They say they identified parasitoids to genus using “specialized literature” and then “separated into morphospecies.”

It seems like I have seen more studies that set baselines for these tri-trophic interactions, but I can’t find them now.  If Pereira Martins is the best available, then ours should be promoted as a new “best in class” type study?

One of the reasons for past assumptions of less diversity of parasitoids could be the impact of historic species concepts in many parasitoids.  For example, the studies from Janzen et al have shown tremendous increases in cryptic species with the application of DNA.  The same may apply to Pereira Martins?

Finally, I find the conclusions such as  “large areas may be necessary for persistent parasitoid metapopulations. Fragmentation of habitat would likely reduce parasitoid diversity and further cascade to impoverish caterpillar and plant diversity…” are probably too strong and not supported by our data.  We did not consider the impact of fragmentation, and we do not know anything about the dispersal of the parasitoids (perhaps they disperse quite well).  I know everybody wants to make conservation proclamations these days, but I think it would be best to stick with the observed results (diversity cascades) and pointing out the need to study fragmentation and dispersal in order to understand conservation and management implications?  (There may also be relevant discussion in the biological control literature, which I do not know well.)

Regarding enemy free space, especially “half of caterpillars’ localities were free from all parasitoids” (line 274), are we sure that this is not an artifact of sampling problems, such parasitoids not being collected according to protocol at some site, not sent out for identification, or perhaps being lost?  Folks who oversaw the field campaign might look carefully at the sites involved and make sure that we trust the meaning of absence of specimens?

Let me try putting a different perspective on the issue of broad proclamations such as “large areas may be necessary for persistent parasitoid metapopulations. Fragmentation of habitat would likely reduce parasitoid diversity and further cascade to impoverish caterpillar and plant diversity…”  I understand the desire to suggest an impact on conservation, but rather than a broad proclamation, what are the actionable implications or research questions that emerge from our data and analysis?

For example, the US National Academies of Science is starting a study on insect decline in North America (by which they include Central America, importantly for Yves’ work in Panama), see <https://www.nationalacademies.org/our-work/status-of-insects-in-north-america>.  How are the conclusions from our data relevant to that study?  For example, what would you like see included as a research recommendation in that study that might be suggested by our data?