All figures in this document are provided in PDF format for your convenience, so that you can modify them directly using Adobe Acrobat or Inkscape. Each figure has been prepared separately, allowing you the flexibility to combine them as needed.

**1\_conceptual:**

This is a conceptual sketch introducing functional specialization und uniqueness. In B) it shows how a species (“Species X”) that is globally very specialized and unique can be less important locally, and vice versa how a species (“Species Y”) that is globally unimportant can emerge as the most important one locally.

**2\_FRic, 2\_spR, 2\_special, 2\_uniq, 2\_fuse:**

These are the global maps at 0.5°x0.5° resolution for per grid functional richness, species richness, specialization, uniqueness, and FUSE.

**3\_compositional\_map, 3\_compositional\_map\_nmds:**

I’m rather proud about this. You asked me to somehow visualize compositional turnover. Using Jaccard distance does only allow us to compare one cell to another. So what I did is I fed the Jaccard distance into a non-metric multidimensional scaling ordination, which is generally referred to as the best ordination method for community data (e.g., Minchin 1987). I used two dimensions and the fit of the NMDS is very good, with stress below 0.07. Now each grid cell has two ordination values, one for NMDS axis one and the other one for NMDS axis two. For the ordination space, I then build a color grid, where each coordinate gets a unique color (plotted in 3\_compositional\_map\_nmds) and used this color to visualize how similar communities are to each other on a global map (plotted in 3\_compositional\_map). Main take away is that the ordination values show a cline, indicating that community change is gradual. And that’s what we can see in the global map as well, with a clear latitudinal gradient and only few outliers (i.e., Black Sea, North Sea, Caspian Sea).

**4\_rank\_plot:**

This figure shows that species that are locally very important (in terms of FUSE) tend to be less important on a global scale.

**5\_local\_global\_overlap:**

This figure shows the opposite, namely that species that are globally very important tend to be less important on a local scale, i.e. there is low agreement between globally and locally important species.

**6\_space\_per\_realm**:

This figure then provides an explanation for the conundrum introduced in the previous figures. It shows the functional space for the Eastern Indo-Pacific compared to the global space. In the local space, the centroid shifted, resulting in species emerging as most specialized that tended to be less specialized on a global scale. Likewise, the non-random subset of the local species pool led to a globally very non-unique species (*Neomonachus schauinslandi*) to emerge as the locally most unique species. Using all species present in the Eastern Indo-Pacific and ranking them based on the global uniqueness values for these species (i.e., uniqueness calculated with the global space), *Neomonachus schauinslandi* ranks as 19th, but using the local space it is first.

**7\_scaling\_plot, 7\_agreement\_map**:

These figures then add some more information on the agreement between globally and locally most important species (using just the species present in the local species pool, how many are simultaneously within the 10 most local important species and the 10 most global important species). The map shows this for FUSE values, and the plot as a function of spatial grain.