Identifying taxa complexes in the bycatch of the Spanish purse-seine tuna fishery in the eastern Atlantic Ocean

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Methods

Modelling approach

We used the *tinyVAST* R package (Thorson et al., 2024) to implement joint dynamic geostatistical spatiotemporal models for each *set type*.

We used a delta lognormal with Poisson link family.

Modelling approach

For each linear predictor:

$$p(s, c, t) = \mu(c) + \sum_{f=1}^{n_f} L_\delta(c, f)\delta(t, f) + \sum_{f=1}^{n_f} L_\omega(c, f)\omega(s, f)$$

Where s represents the location in space, c represent taxa, f represents the factors, and t represents years. Temporal variation is represented by $\delta(t, f)$. L_δ and L_ω are the loading matrices.

Modelling approach

Temporal variation follows a random walk:

$$\delta_{t,f} = \begin{cases} \zeta(t,f) & t = 1 \\ \delta(t-1,f) + \zeta(t,f) & t > 1 \end{cases}$$

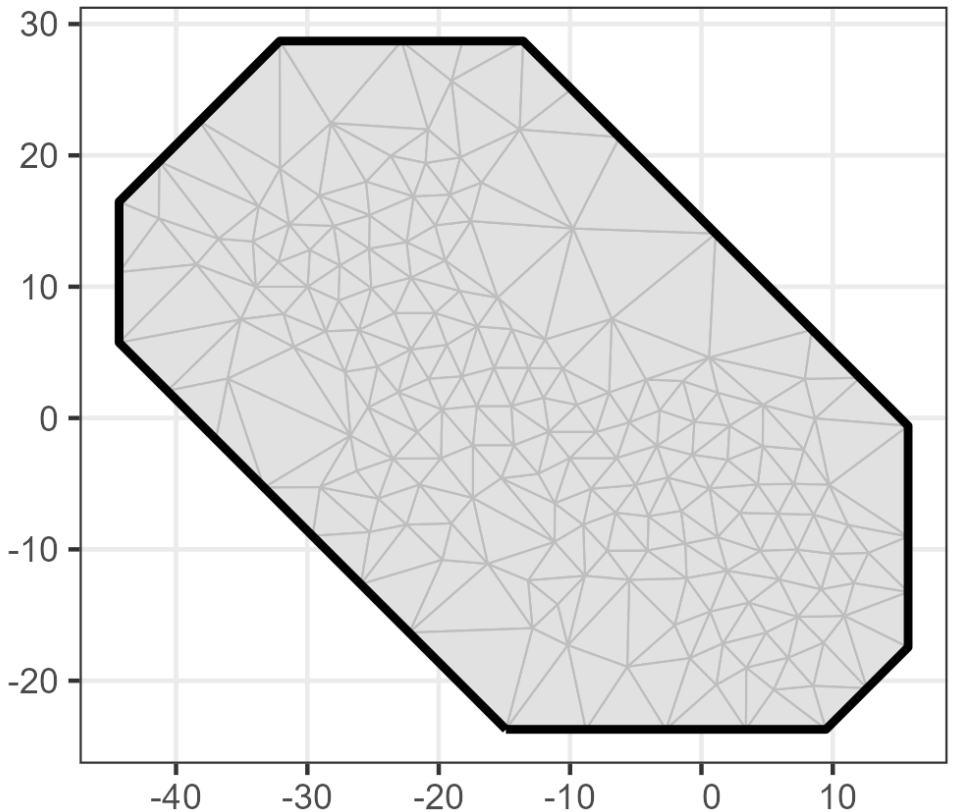
Where $\zeta(t,f)$ follows a standard normal distribution.

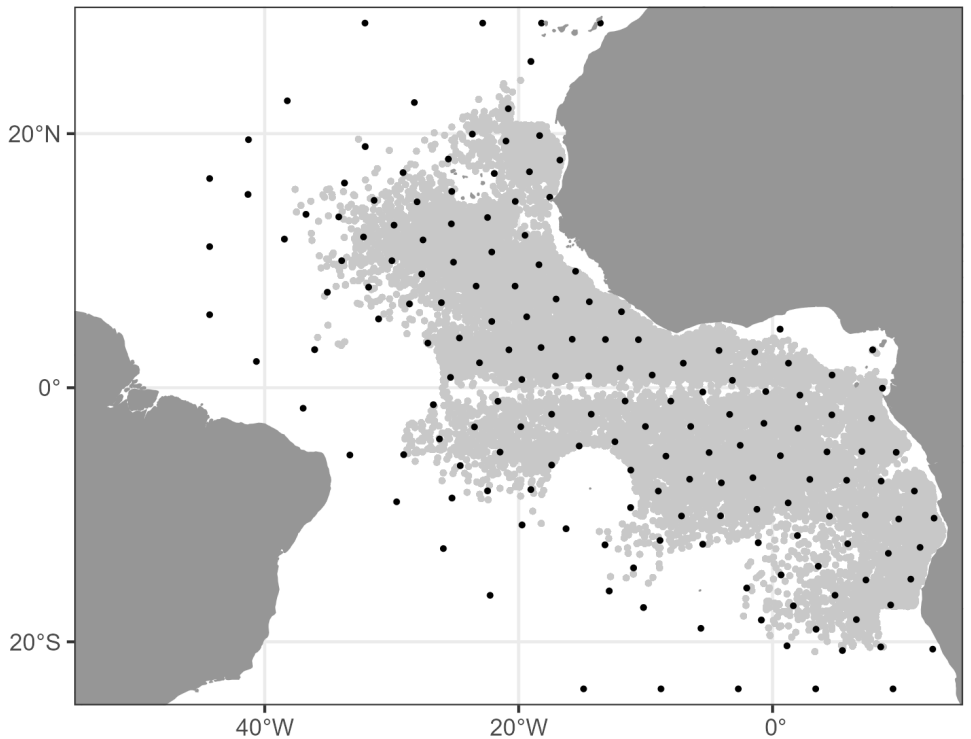
Modelling approach

We started modelling two factors ($n_f = 2$), and then successively increase the number of factors until the final factor explains less than 5% of total explained variance.

FOB model

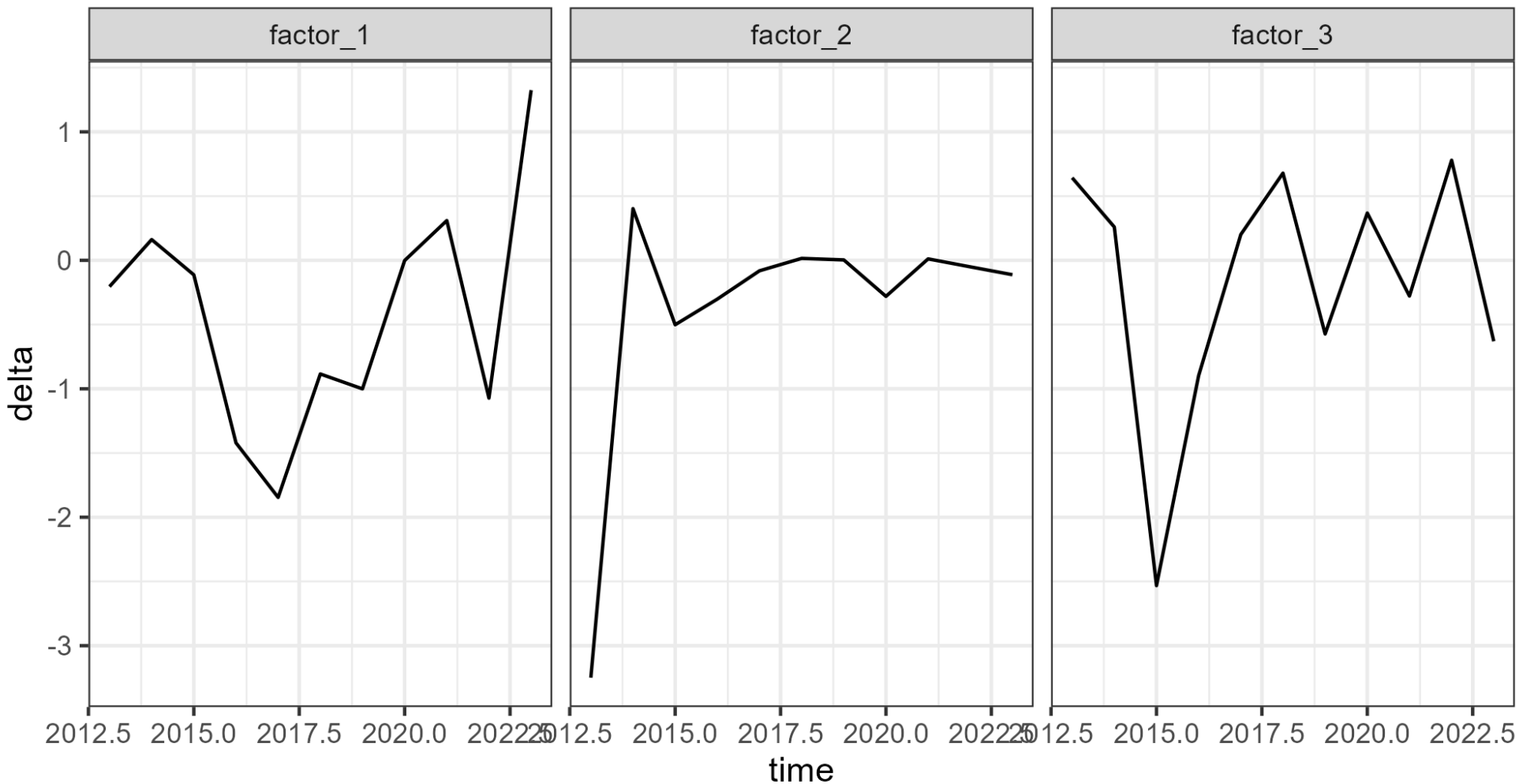
Mesh





Time variation ($n_f = 3$)

For model component 1:



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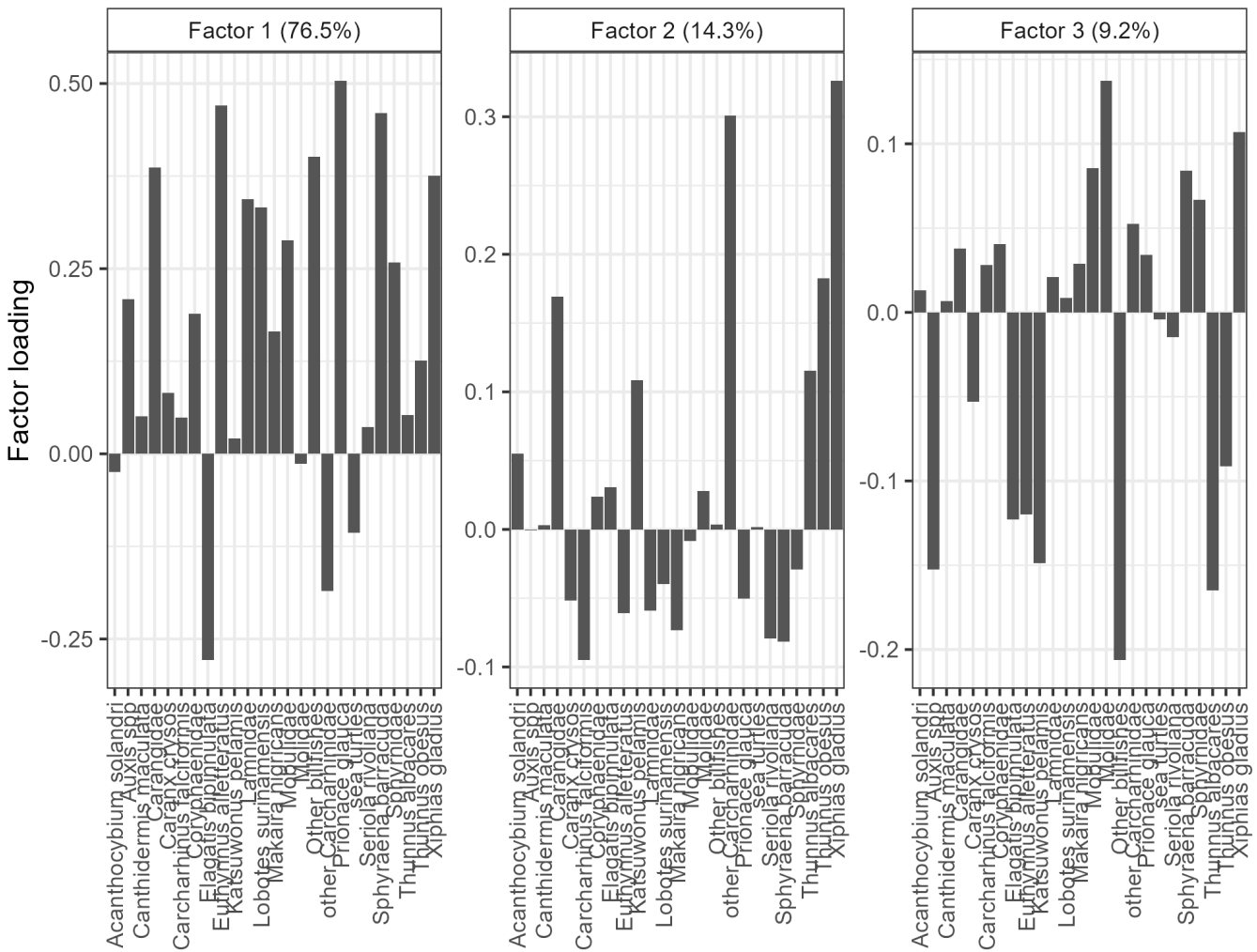

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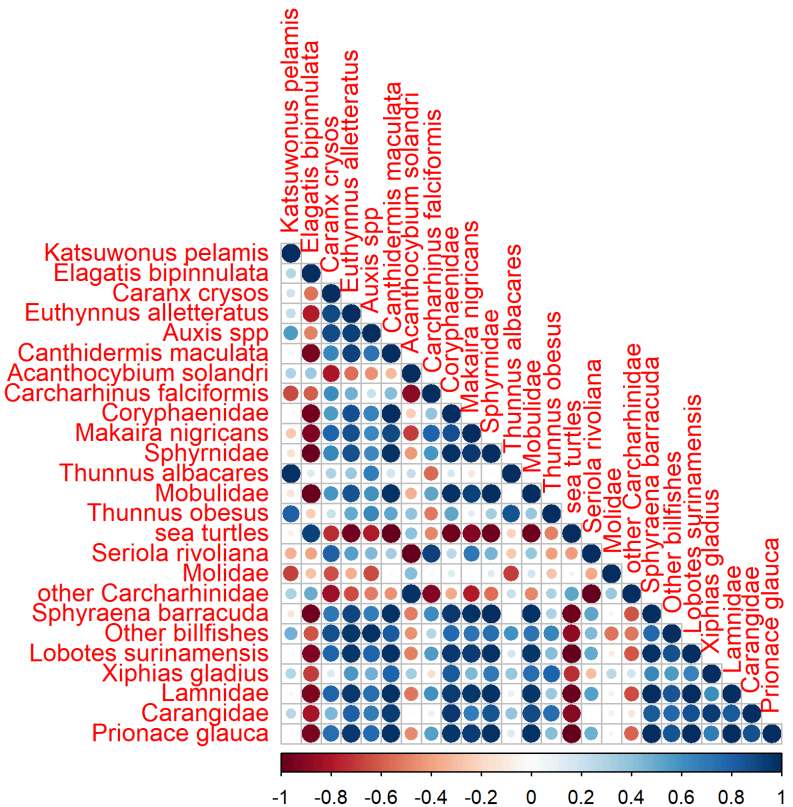
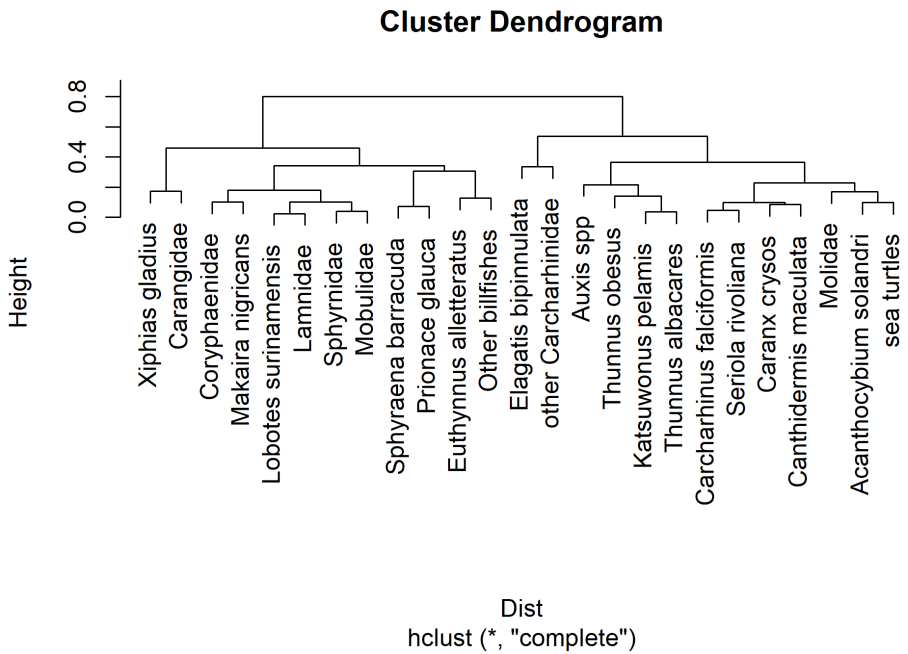
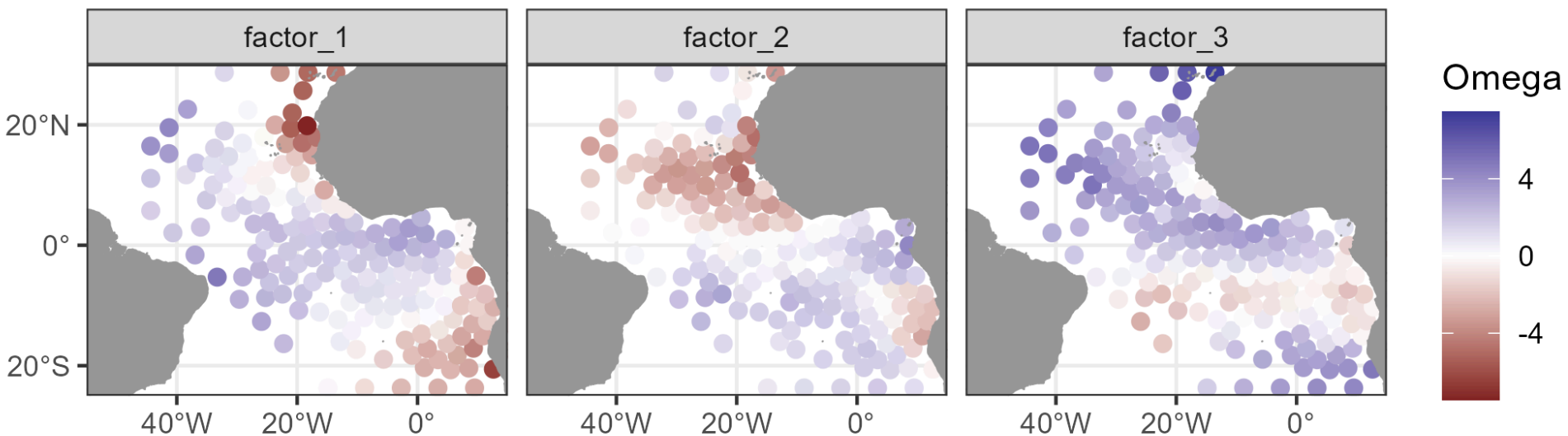




Spatial term ($n_f = 3$)

For model component 1:



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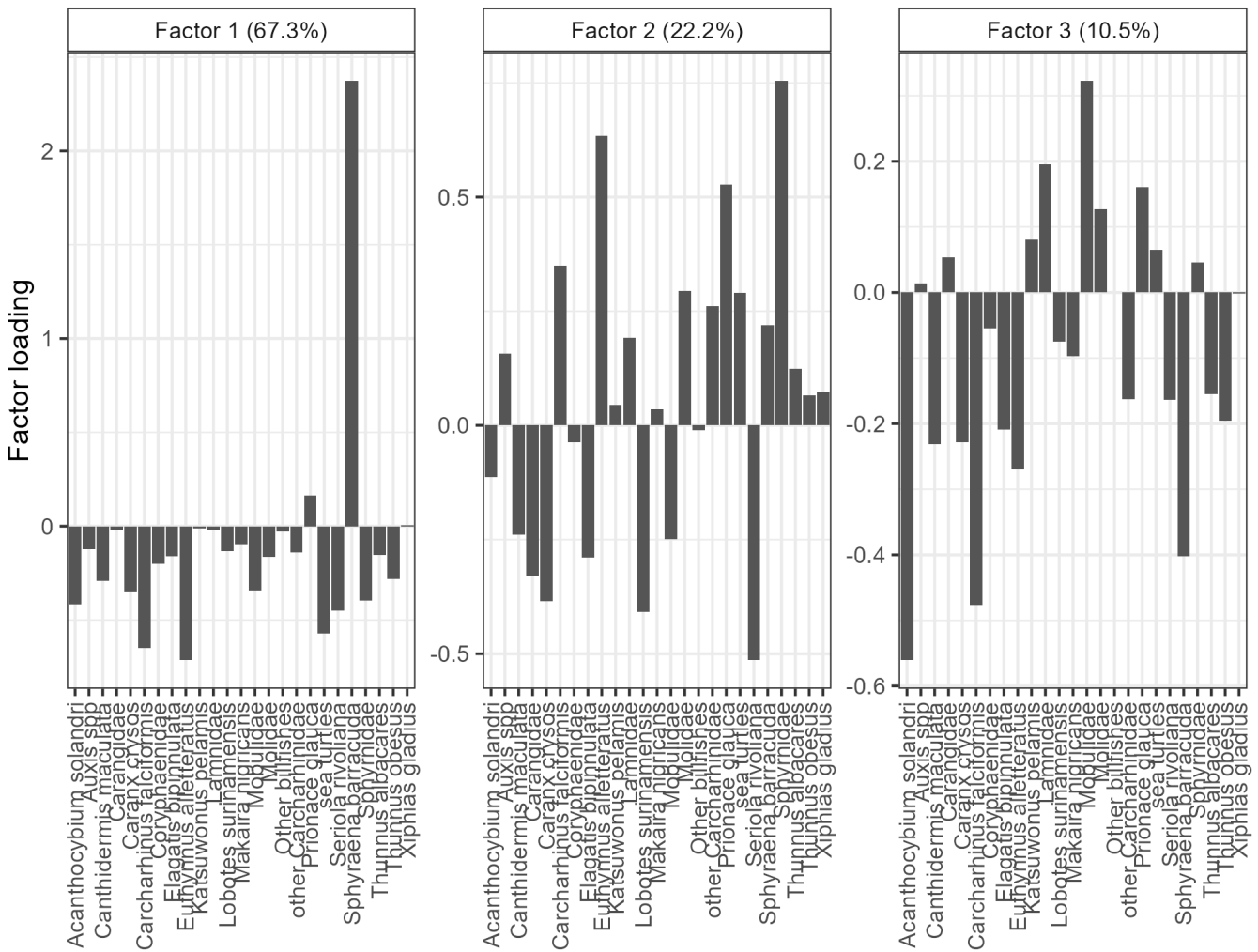

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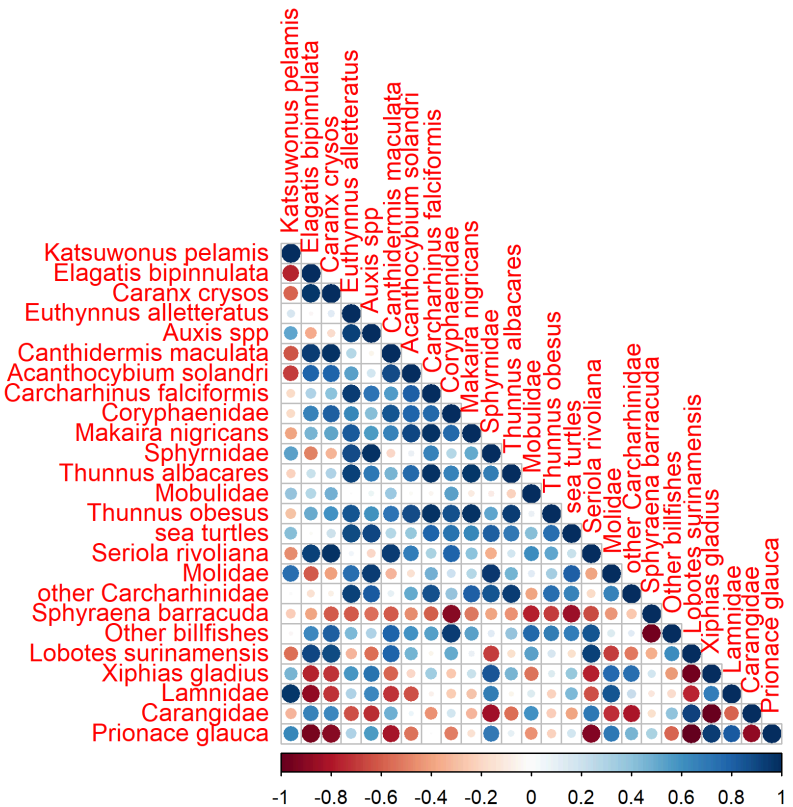

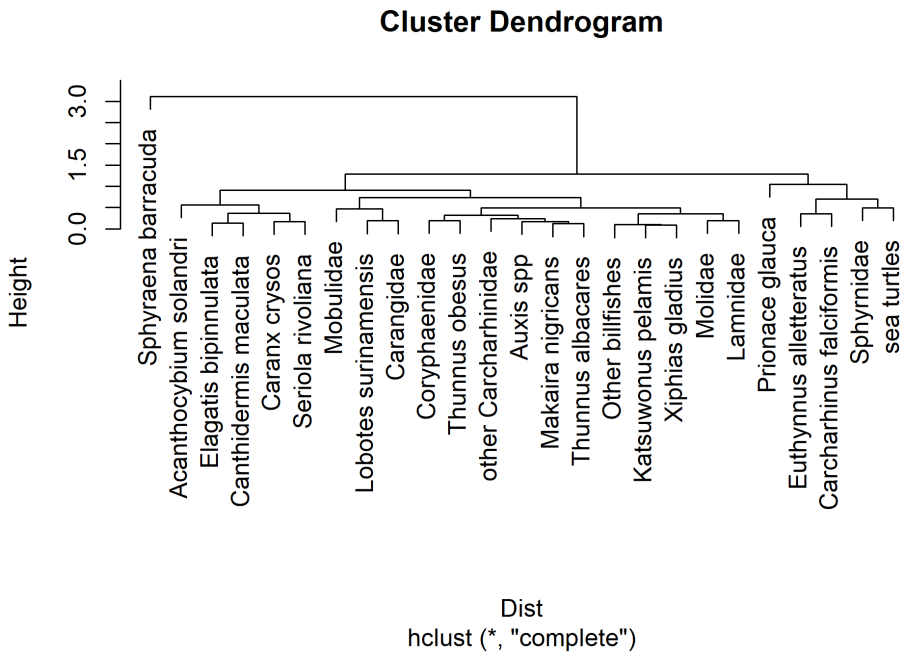

Discussion

- No need to use all taxa
- Remove discard species (?)
- No need of environmental information
- TODO: Find optimal number of clusters
- TODO: do analysis for FSC fleet
- TODO: Test Tweedie distribution
- TODO: Combine component 1 and 2 into a single analysis to examine species relationships

Thank you

AZTI
MEMBER OF
BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

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References

Thorson, J.T., Anderson, S.C., Goddard, P., Rooper, C.N., 2024. tinyVAST: R package with an expressive interface to specify lagged and simultaneous effects in multivariate spatio-temporal models. arXiv Statistics. https://doi.org/10.48550/arXiv.2401.10193