Climate effects on species-location choices

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1   Introduction

- Research question:

  - **Big question:** What is the effect of climate change on fish patterns.
  - **Narrow question:** How does changes in the presence of CPS affect species and location choices by vessels registered in the US west coast?
  - Check if state limits affect the behavior of fish decisions.

- Contribution:

  - SDM projections to forecast fisher behavior
  - Better understanding of fishers species portfolio
  - Policy analysis

- Method

  - Mixed logir model:

    * Mixed logit? (A mixed logit (or random-coefficient logit) avoids assuming IIA allowing for marginal utility varies between individuals)
    * Relax the independence of irrelevant alternative assumption: Coeficient vary randomnly across vessels, and "Variance in the unobserved vessel-specific parameters induces correlation over alternatives in the stochastic portion of utility." Revelt and Train [1998]
    * Account for correlation in unobserved utility between repeated choices Revelt and Train [1998]. The estimations is efficient.

- Characterize the fishery

  - Heterogeneity in location, do a map and calculate variation on latitude and longitude.
  - How far from ports
  - How far from the coast.
  - Average distance traveled.
  - Fishing effort

2 Species/location choice model for the CPS fishery

- Choices:

  - Set of location/specie
  - Number of choices can vary between vessels, as well as the number of periods or choice situtations Revelt and Train [1998].
  - Use Hicks et al. [2020] methodology to select the choice set:
    * Crucial for the model the selection of the choice set. If is erroneous, our estimates would be biased.
    * We don't observe fishers complete set of alternatives. "A limitation of all of the models discussed thus far is the assumption that the choice set is finite and tractable. In the caseof spatial choice models in a number of environmental settings, including fisheries, the choice set is virtually infinite as spacecan be continually divided to form different "alternatives.""
    * They propose a method to construct alternative choices when alternative are effectively infinite *we just observe a point where vessel fish over a very large open ocean area).
    * What is wrong with aggregating fishing areas? -> "areas may encompass highly heterogeneous fishing locations in terms of species composition and density or feasibility of fishing (e.g.unfishable rocky areas)". THIS COULD BIAS OUR RESULTS.
    * How this work: "Sample points from a fine scale grid of specific locations." It is a point-based approach for choosing the choice set.
    * Should improve modeling in setting with fine-scale spatial heteogeneity.
    * The method is called: **Grid point-based sampling models.**
      · The region study is restricted, but within the region there are infinite points.
      · The choice set considerate **depth on water**. Does this is an important variable for CPS fisheries?

- Explanatory variables:

  - Species value? This assumes fisher that has rational preferences and maximizes utility. It might be that they harvest a species as they have been doing it for a long time. Landings;
  - Vessel characteristics (Note: Not all vessels go to the exact location, so that decisions might depend on their characteristics).

– Expected catch / species abundance?

- Data

    – CDWF logbooks and landings (Caitlin)

    – PacFIN landings by vessel & logbooks (try to connect to Global Fishing Watch).

    – SDM's from Barb

- Consideration:

    – Choice set important (locations and species).
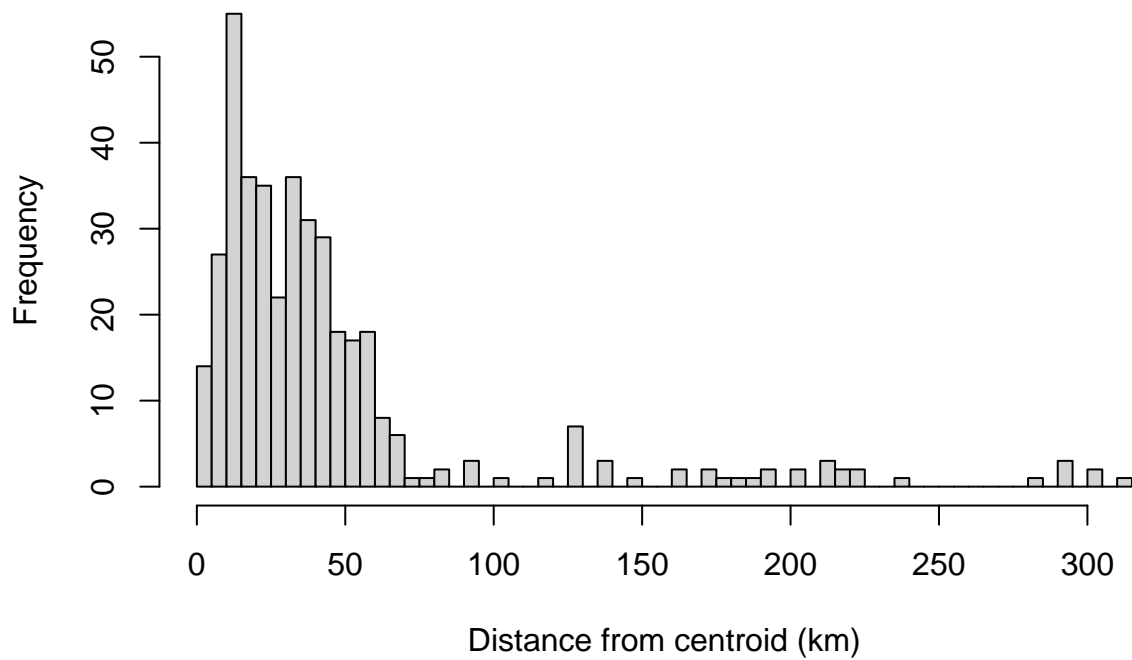
    – Outside option?

3   Graphs

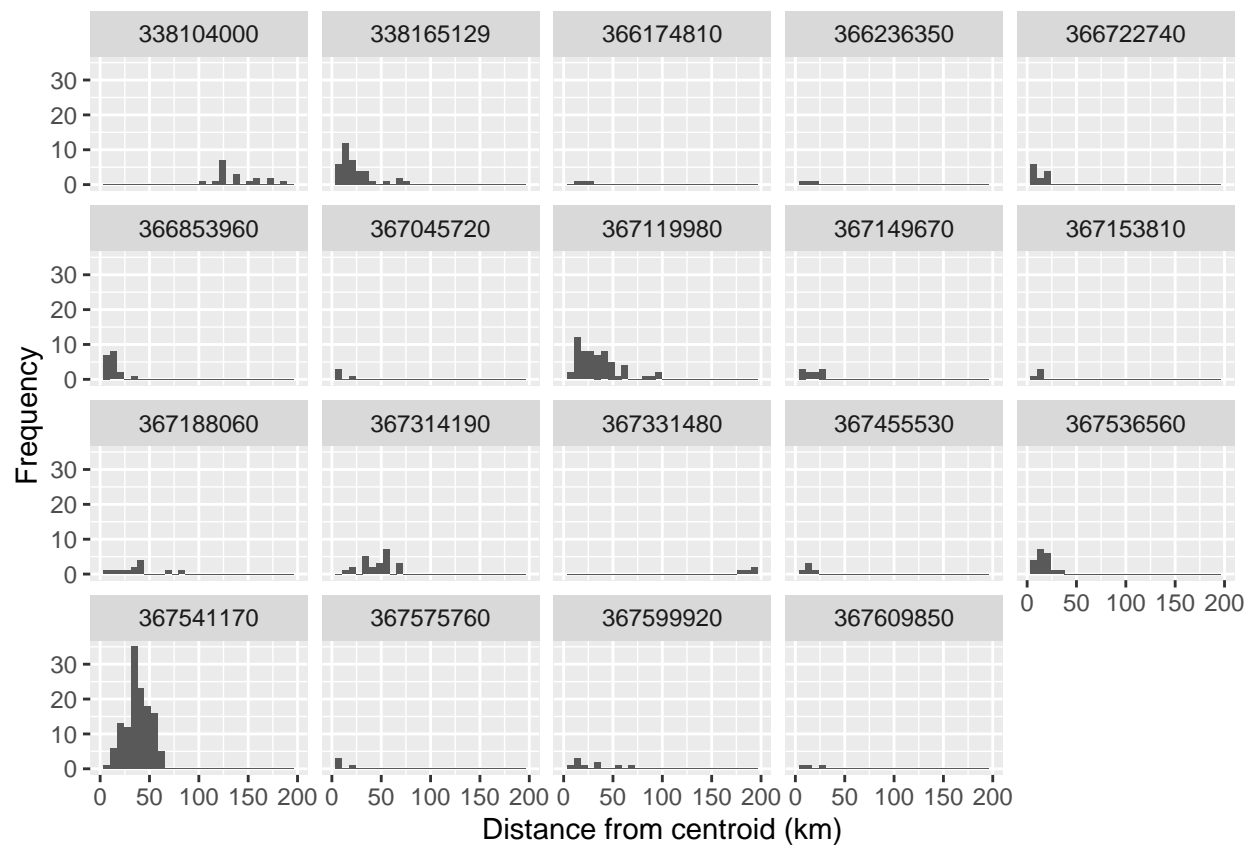Figure 1: Histogram for distance from centroid

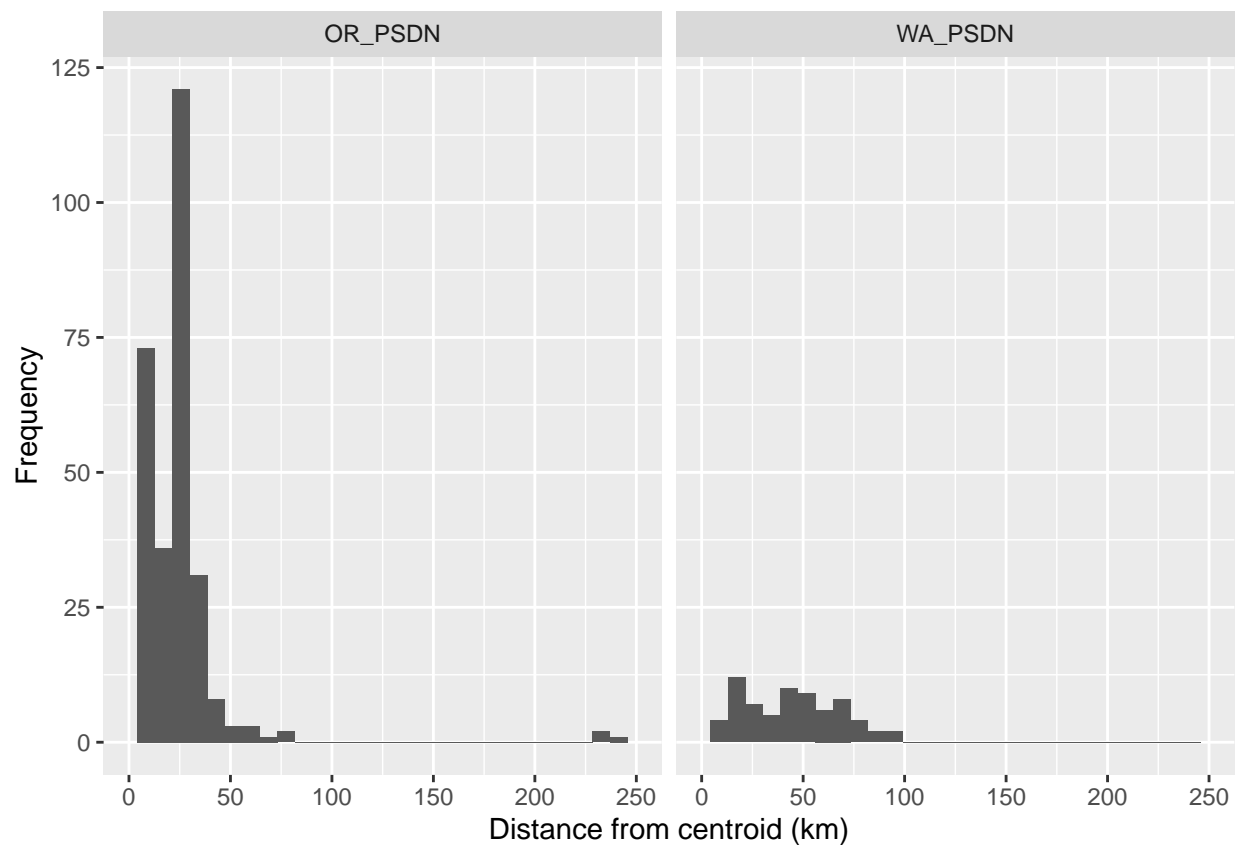Figure 2: Histogram for distance from centroid by vessels

Figure 3: Histogram for distance from centroid by fleet

References

Robert L. Hicks, Daniel S. Holland, Peter T. Kuriyama, and Kurt E. Schnier. Choice sets for spatial discrete choice models in data rich environments. *Resource and Energy Economics*, 60:101148, 2020.

David Revelt and Kenneth Train. Mixed logit with repeated choices: Households' choices of appliance efficiency level. *Review of economics and statistics*, 80(4):647–657, 1998.