Future Seas

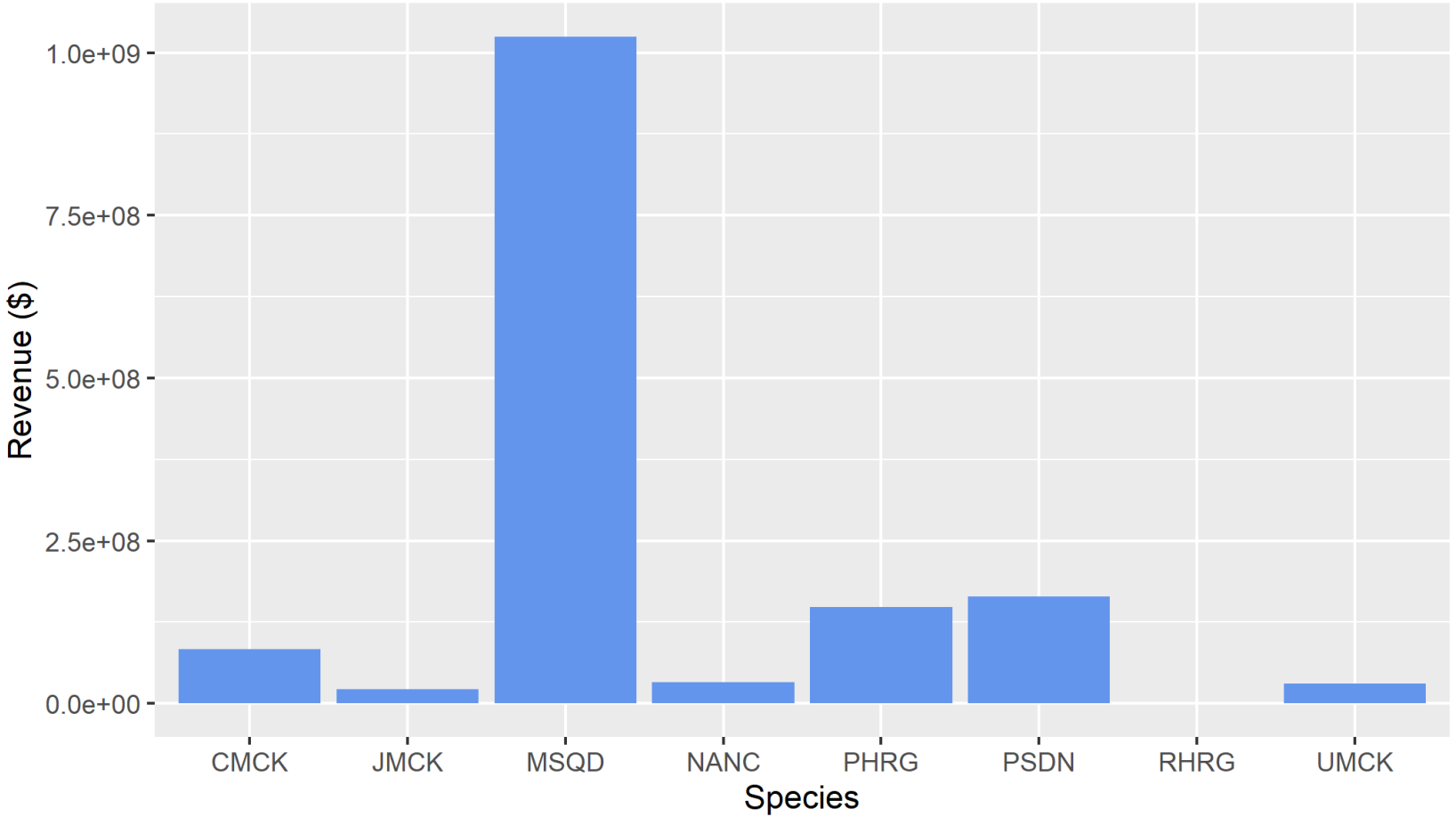
Econ Report

Felipe Quezada
UC Santa Cruz & NOAA SWFSC
May 6, 2021

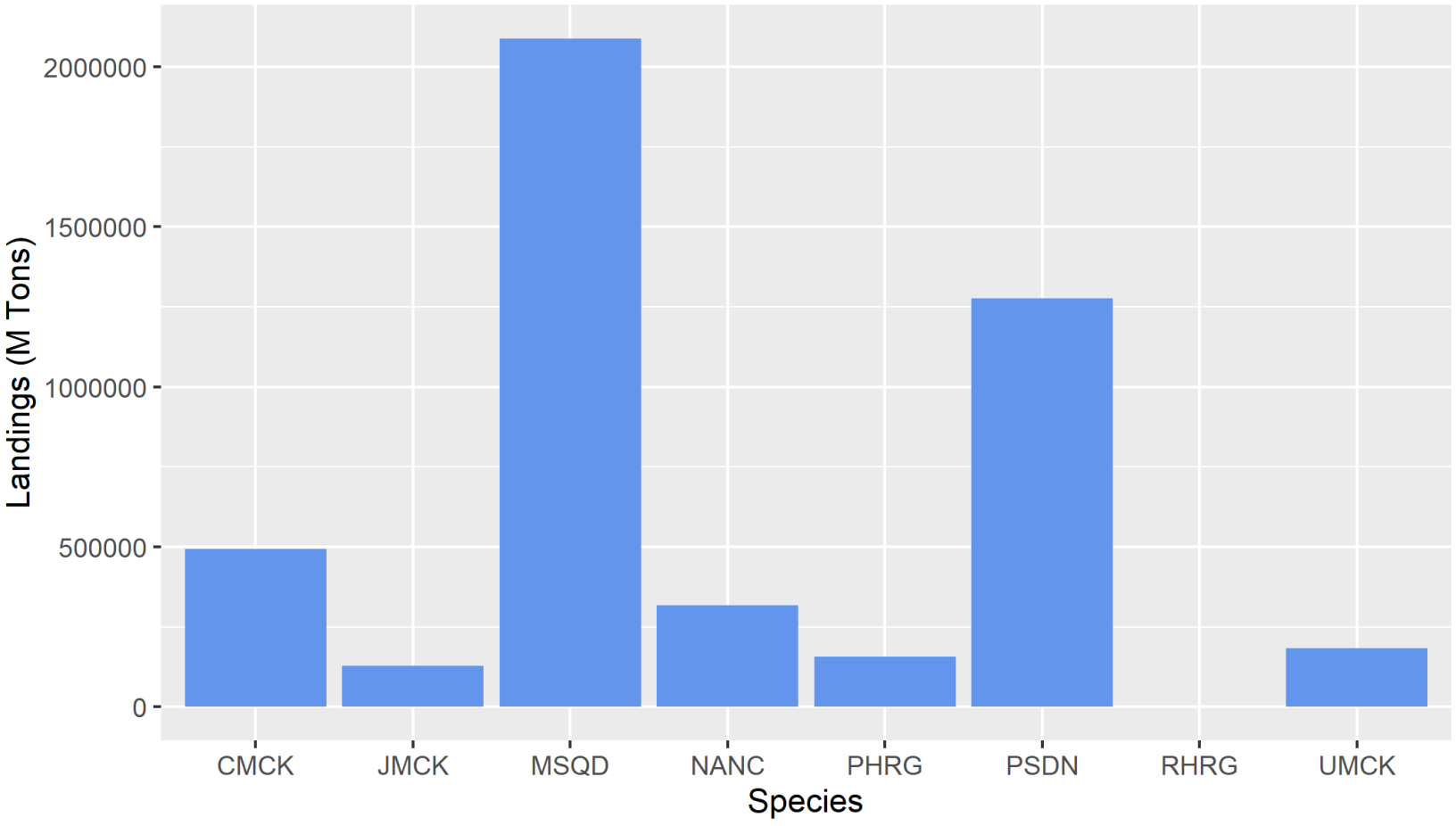
Table of contents

Historical data

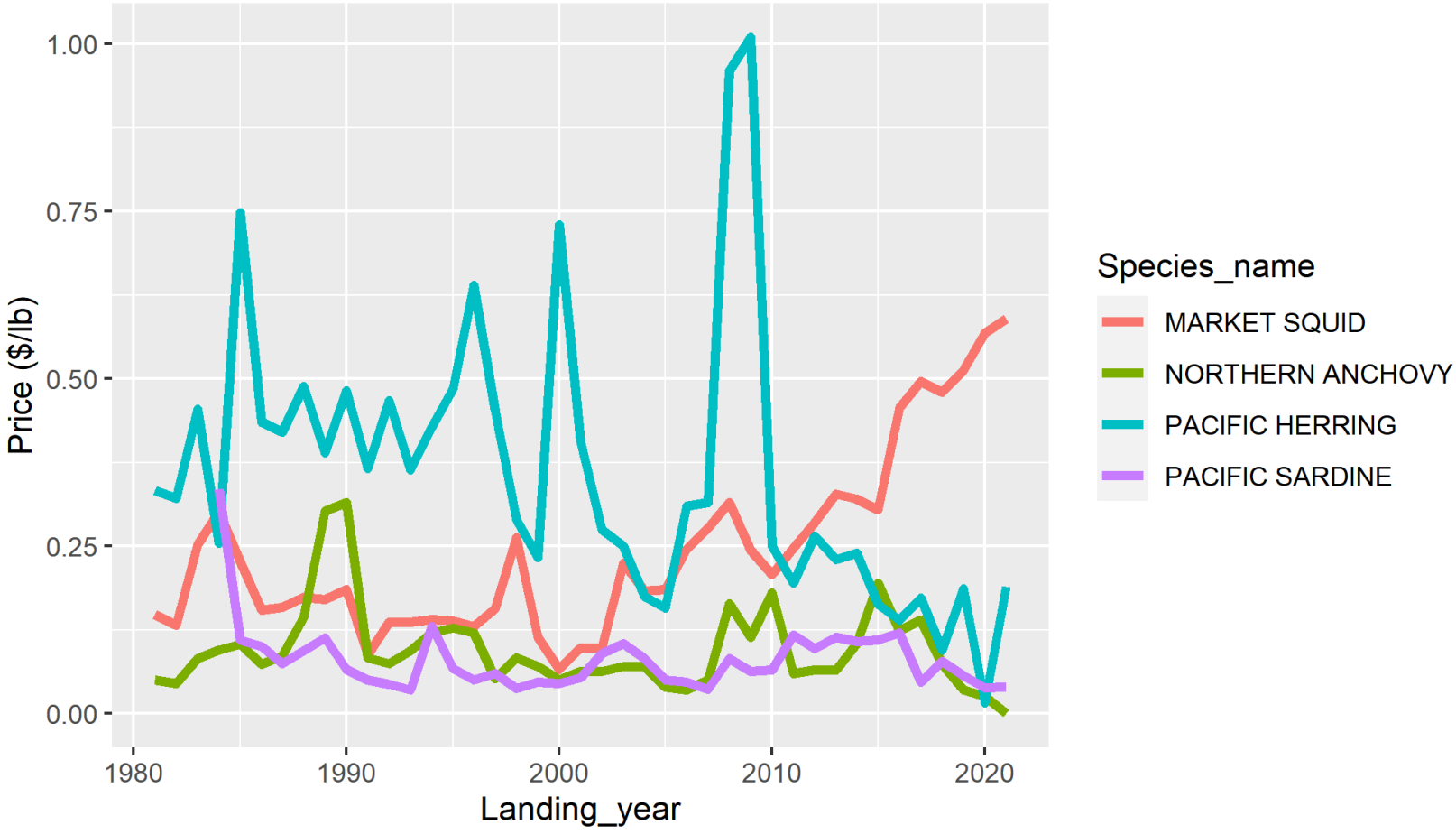
Annual mean revenues by CPS species



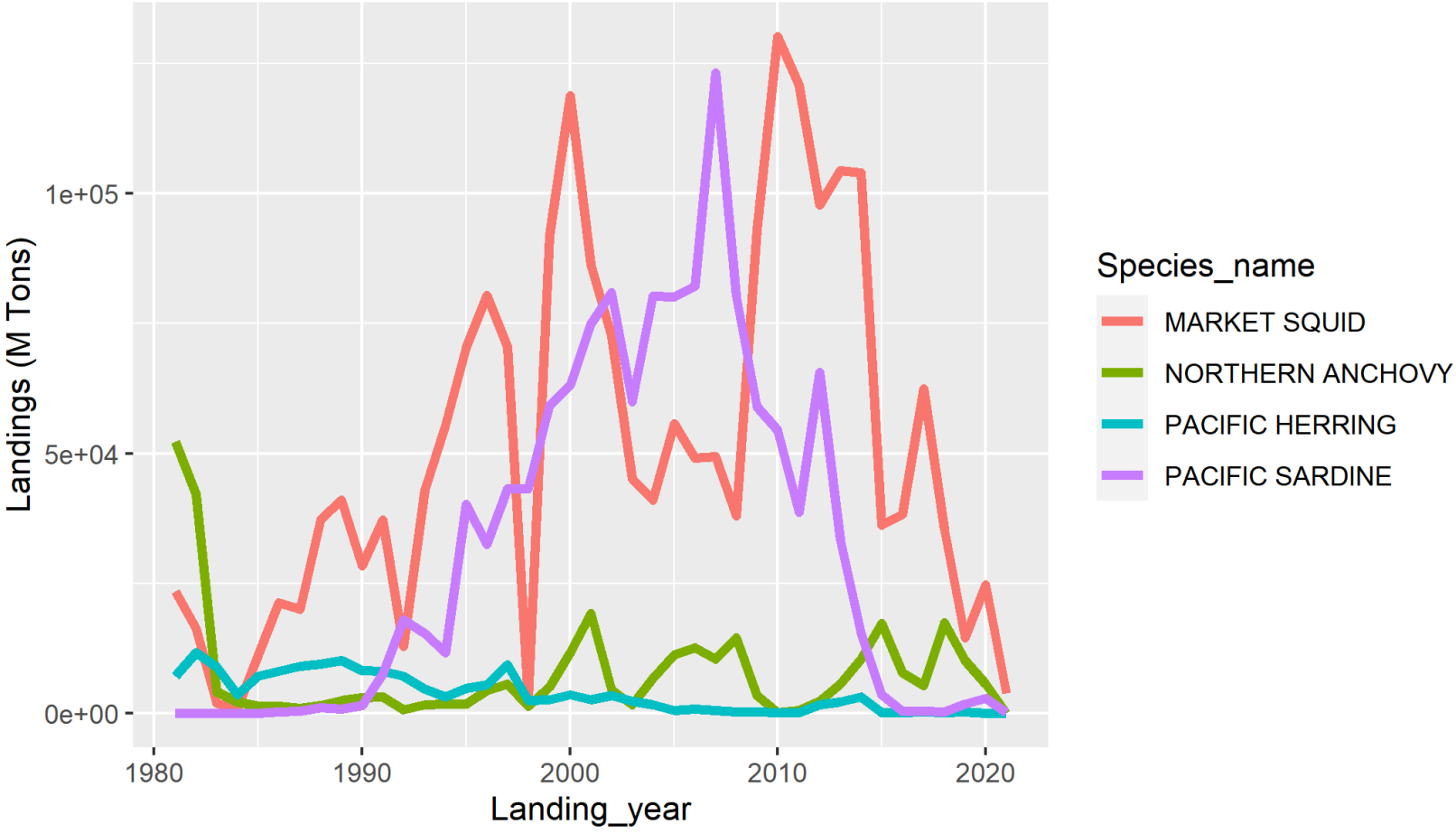
Annual mean landings by CPS species



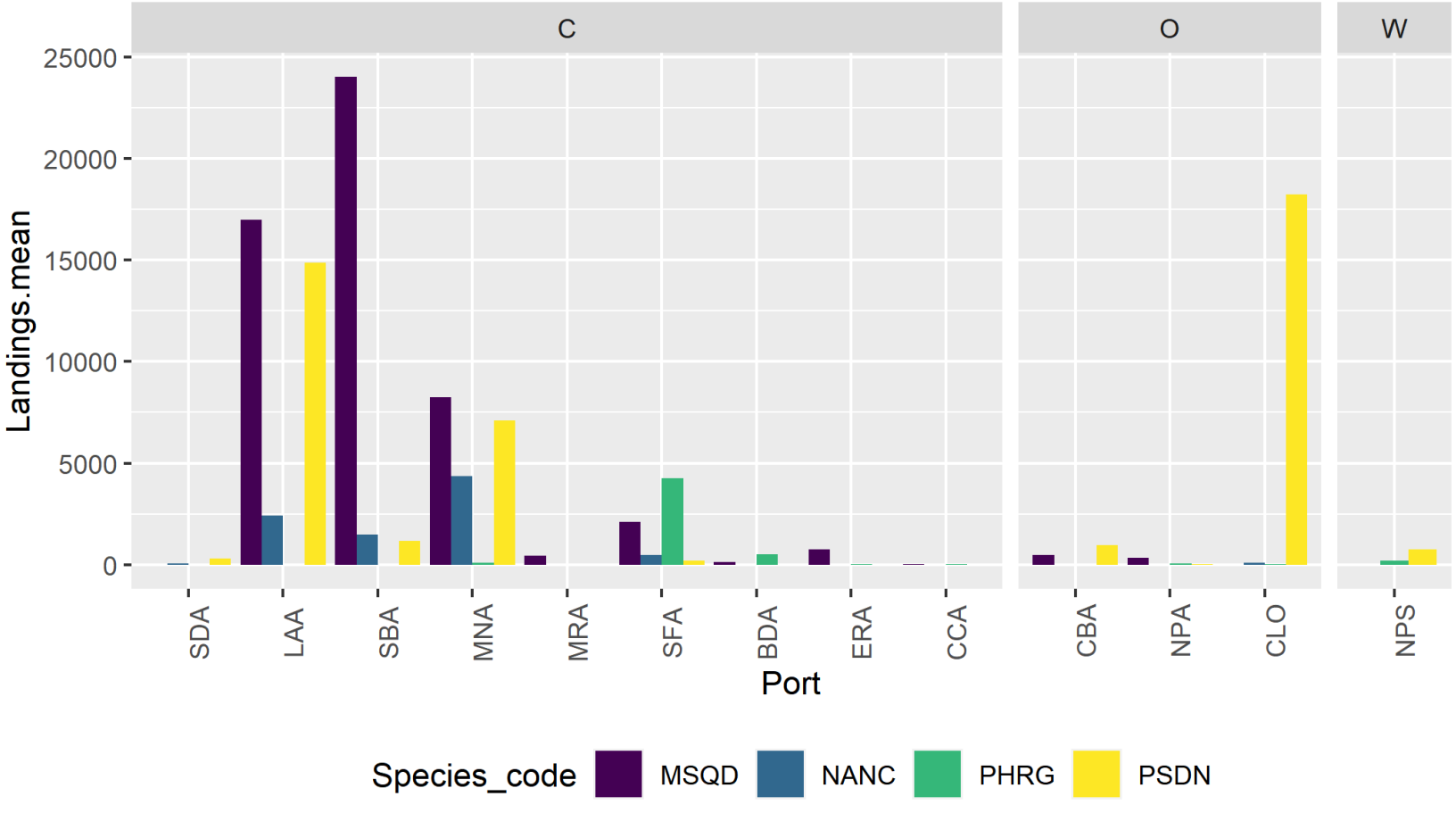
Annual averages prices by CPS species



Total annual landing by CPS species



Landings by port area



Landing model

Research question

- **Big question:** What is the effect of climate change on fish landings?
- **Narrow question:** How does changes in the presence of sardine/anchovy/market squid/herring affect landings at ports located in the US west coast?
    - Smith et al. [2021]
    - Landings conditional to biological stocks
    - Affected by climate change
    - Other decision variables
- **Contribution:**
    - Interaction between species.
    - Better undertanding of fishers species portfolio.

Variables

- **Outcome variable:** Landings by species at port j and year t.
  - PacFIN data
- **Treatment variable:** Change spatial distribution of species due to climate.
  - Smith et al. [2021]: probability of presence from SDM.
  - Projection.
- **Explanatory variables:**
  - Harvest costs (e.g., distances x fuel cost)
  - Own price and substitutes
  - Effort
    - Global Fishing Watch
  - Regulations.
    - Annual Catch Limits
    - Closures

Empirical strategy

- **Bayesian hierarchical model:**
  - Model:

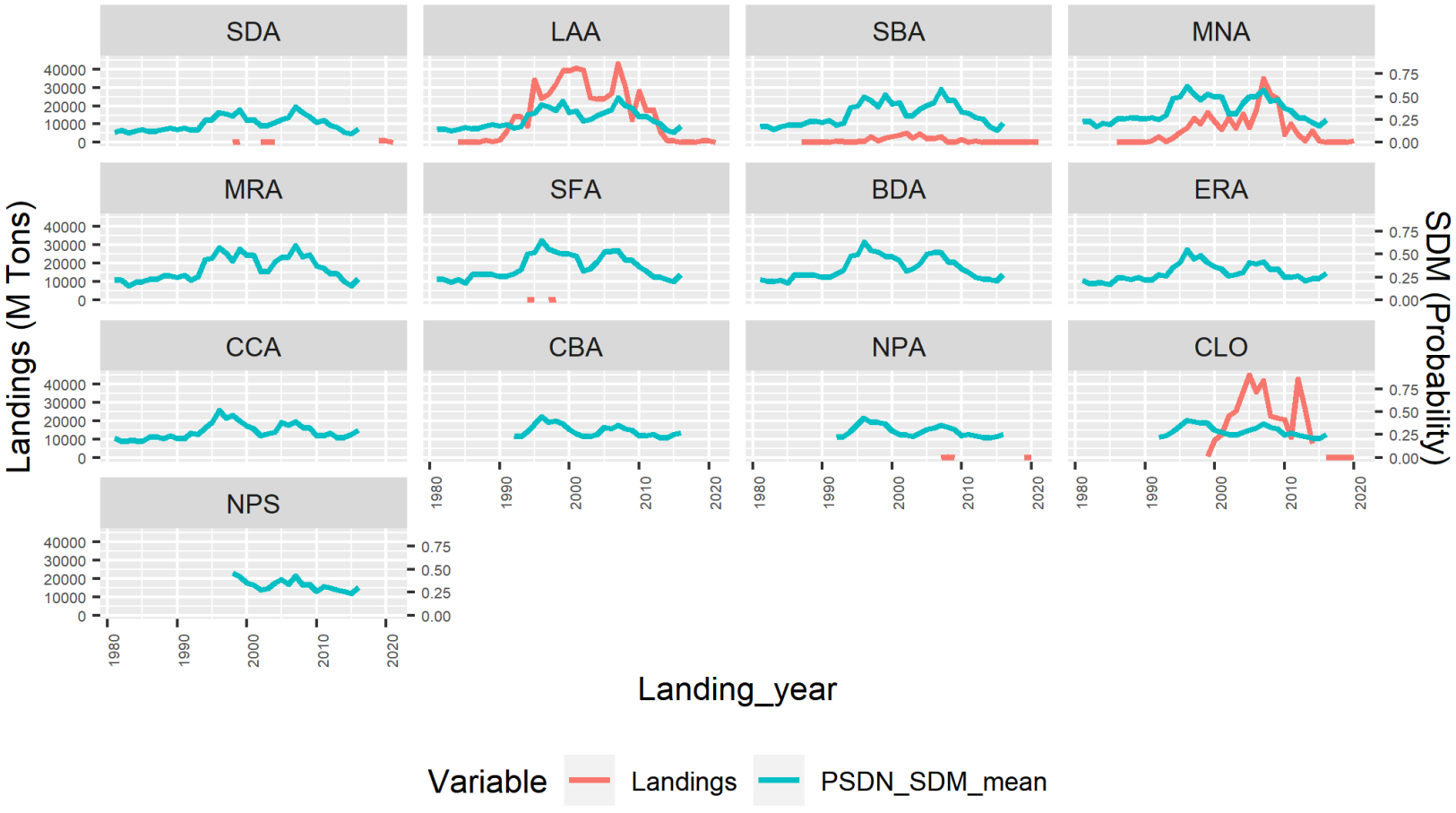
$$[\alpha_i, \beta_i, \gamma, \sigma^2_\alpha, \sigma^2_\beta, \Sigma | \log(q_{i,t})] \propto \text{multivariate normal}(\log(q_{i,t}) | \log(\mu_{i,t}), \Sigma)$$
$$\times [\alpha_i | \mu_\alpha, \sigma^2_\alpha] \times [\beta_i | \mu_\beta, \sigma^2_\beta] \times [\gamma][\mu_\alpha][\mu_\beta][\sigma^2_\alpha][\sigma^2_\beta][\Sigma],$$

    where i indicates port, t indicates years and

$$\mu_{i,t} = \alpha_i + \beta_i SDM + \gamma Price + \dots$$

- **Some considerations:**
  - How far vessels travel to harvest? 60km?
  - Non-linear relationships (GAM in Smith et al. [2021])
  - True zeros? (i.e., no landings by choice)
    - Closures
    - Port restrictions (i.e. no landing infrastructure)

SDM outputs v/s landings by port area



Future research

Future research

- **Fishers portfolio model:** Determinant of fisher decision on species harvested.
- **Location choice model:** How fishers decide where to fish?
- **Trade-off of leaving forage species in the ocean:** Do fishers take into account trade-offs in their harvest decision?
- **Effect of climate change on fishing communities:** How climate change affects fishers communities that depend (directly or indirectly) on forage species?
- **Price determination model?**

Thank you for your attention!

felipequezada.com

fequezad@ucsc.edu

Postdoctoral Scholar, UCSC/NOAA-SWFSC