

Marine Heatwaves

FISHGLOB

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How have marine heatwaves (MHWs) affected biomass in the trawl surveys?

Predictions

1. No MHW effect on biomass or community composition
2. Loss of cold species is greater than gain of warm species -> net biomass loss
3. Gain of warm species is greater than loss of cold species -> net biomass gain (tropicalisation)
4. No net biomass change, but community composition shifts toward a higher overall thermal niche (community turnover)

What we know

MHWs are becoming increasingly frequent and intense ... and so are papers about them

Most studies on MHWs find deleterious effects on species and communities

- Many are focused on coral reefs, or on historically dominant species in an area

Methods: MHWs

MHWs calculated in each survey region

All anomalies defined relative to the region

MHW-days: >95% for temperature

MHW-years: >90% annual SST (3 per region)

Many different metrics for MHWs

Methods: trawl data

Analyzed North America

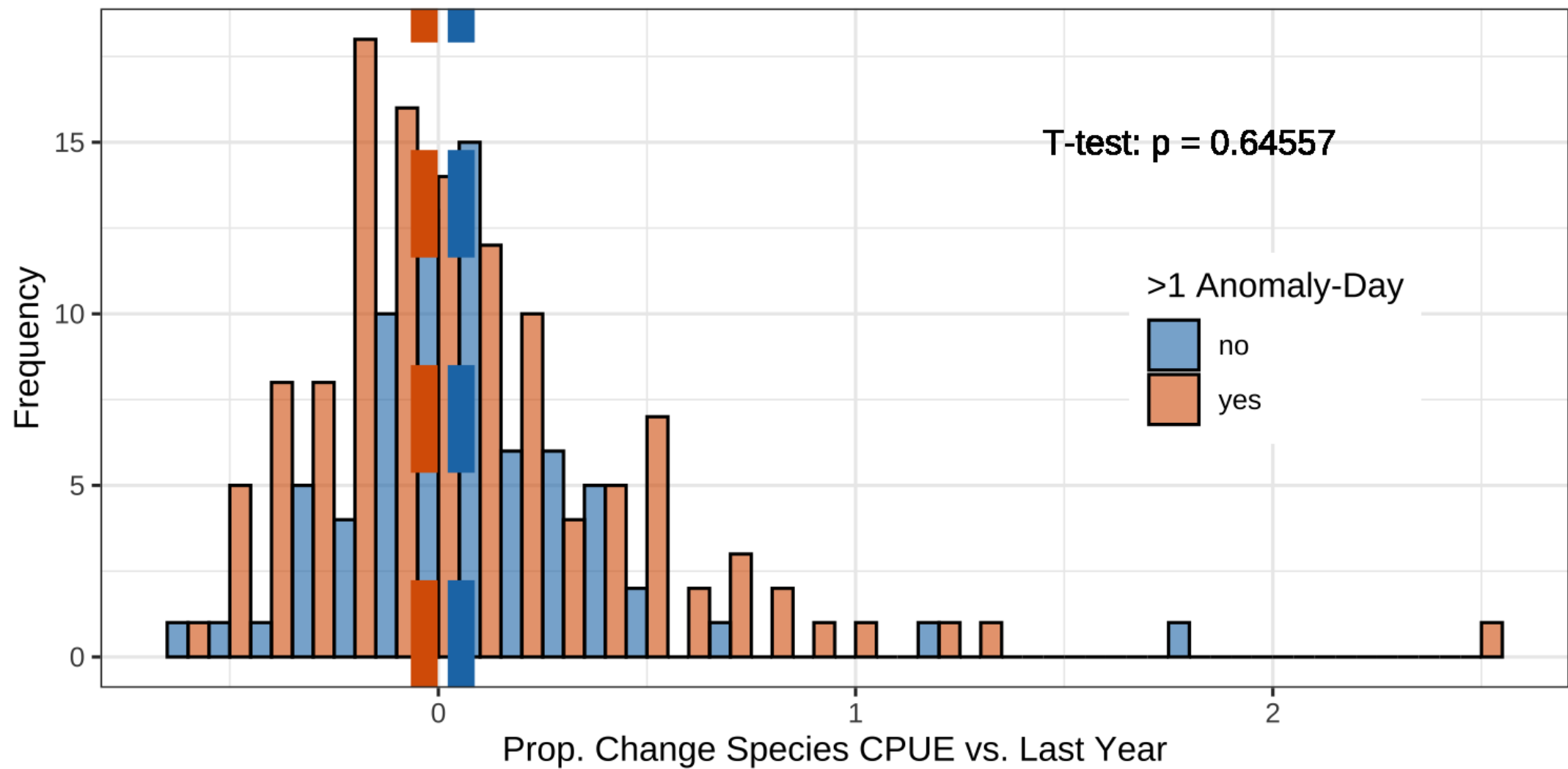
For each species, calculated mean weight within strata, and multiplied by stratum area

Then added these up to get total single-species and net biomass for each region

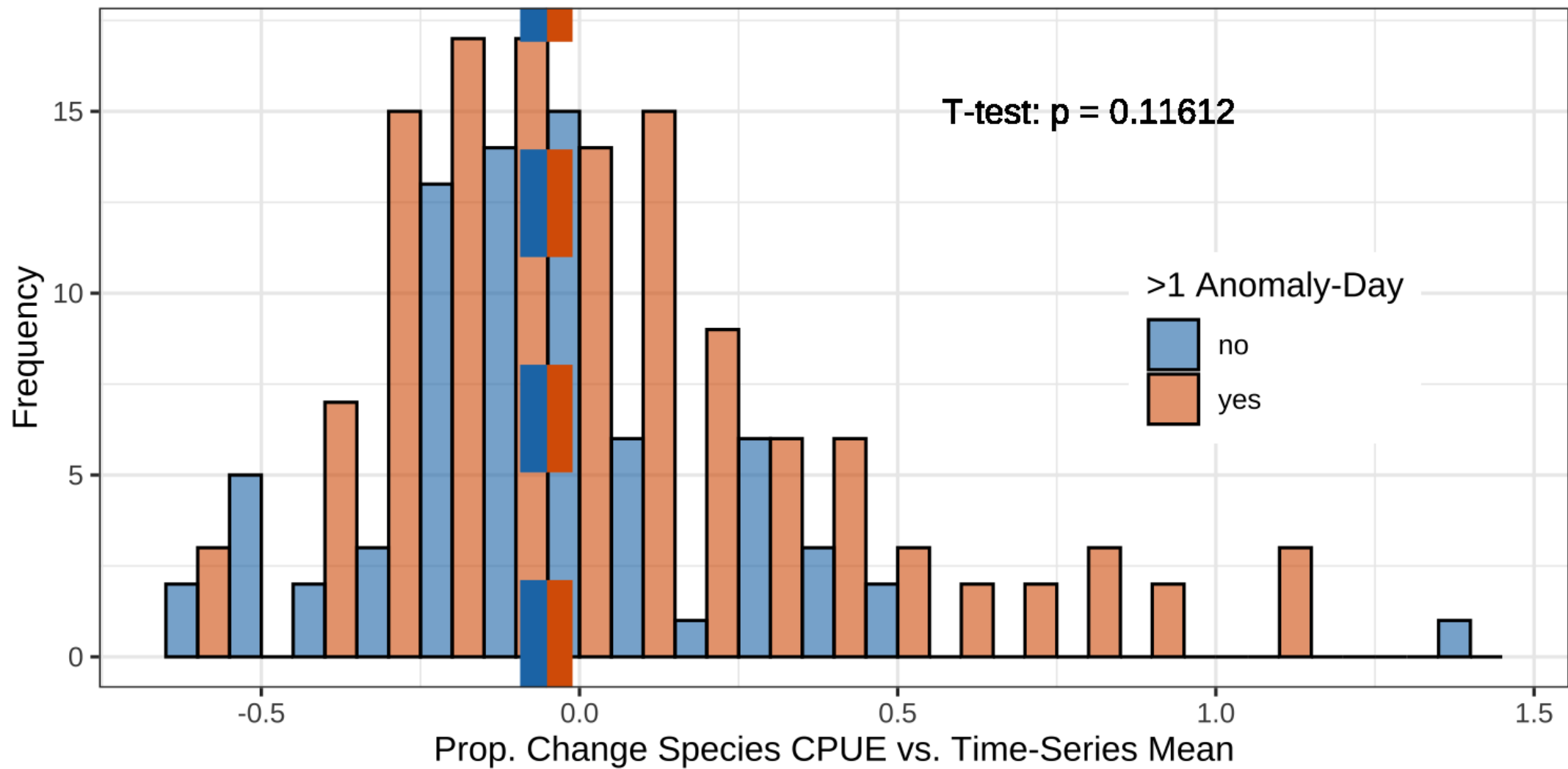
Four current metrics for biomass change:

- Mean species-level change vs. last year
- Mean species-level change vs. time-series mean (anomaly)
- Net biomass change vs. last year
- Net biomass change vs. time-series mean (anomaly)

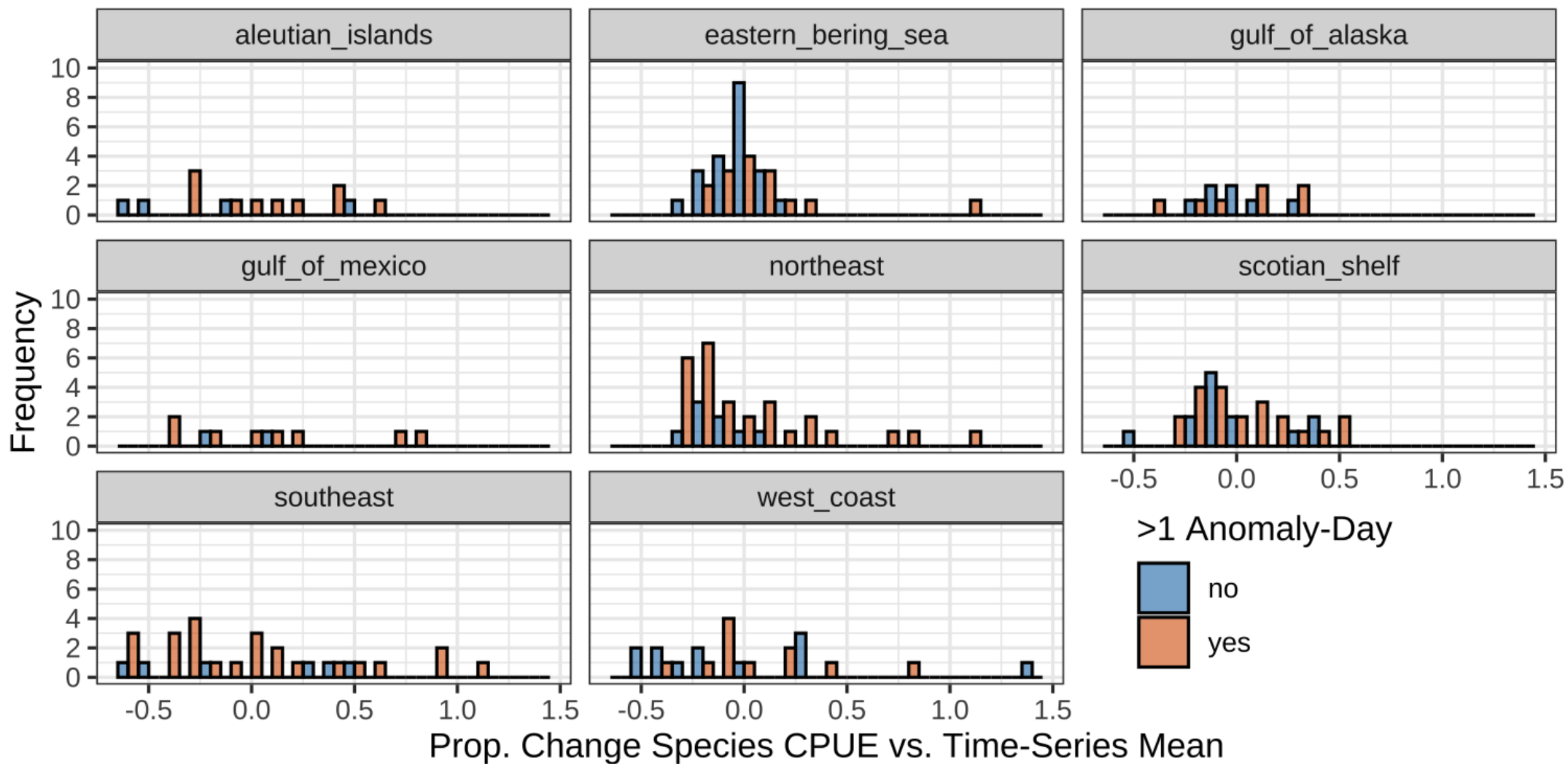
Paired these with MHW data *from the 12 months preceding the earliest survey month*



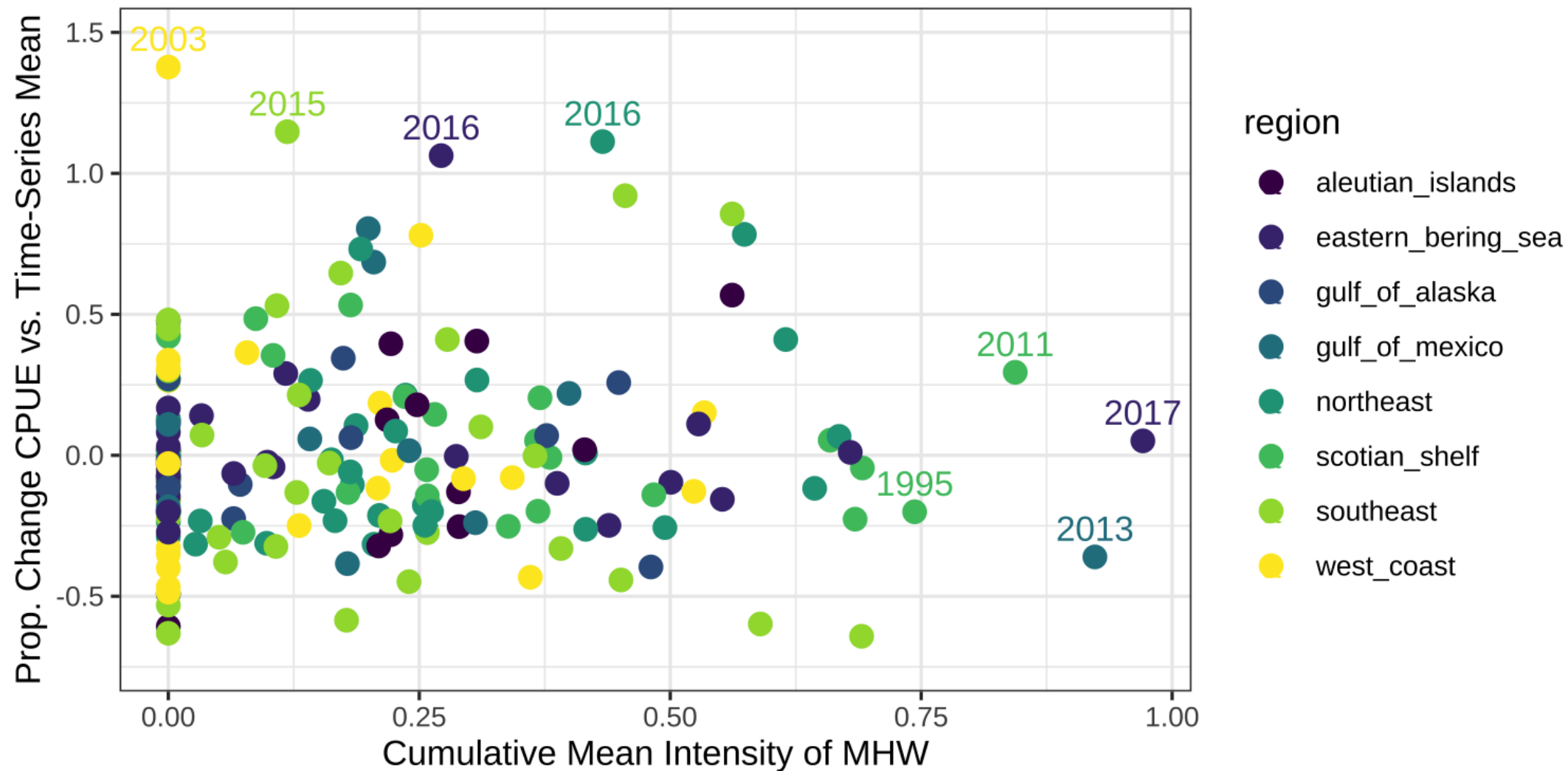
Biomass Change vs MHW-Years



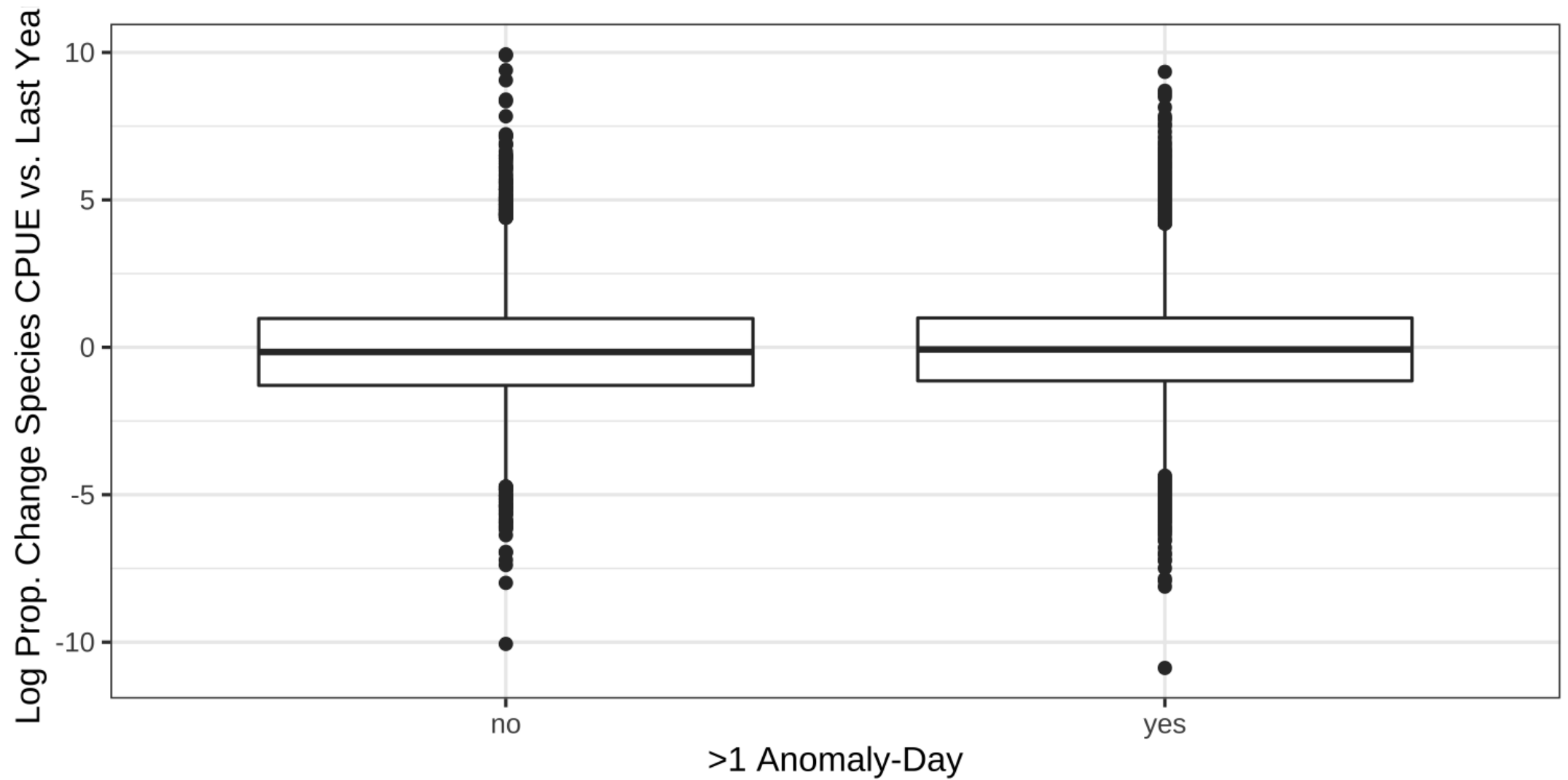
Biomass Change vs MHW-Years



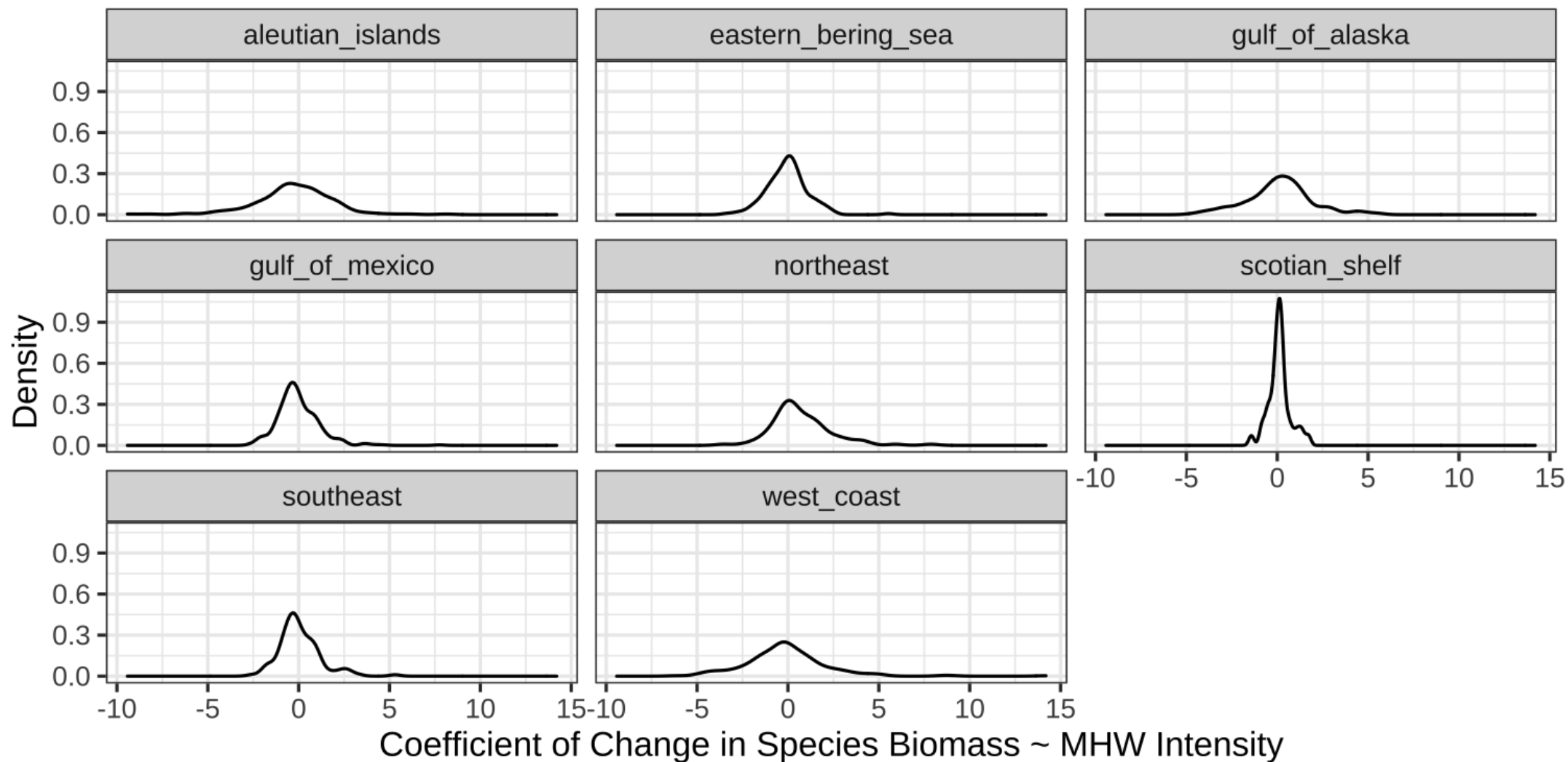
Biomass Change vs MHW-Years



Biomass Change vs MHW-Years



Log Species Proportional CPUE Year-Over-Year Change in MHW and Non-MHW Years



Distribution of Coefficients for Single-Species Linear Models of Biomass Change on MHW Intensity

Preliminary result: no change in net biomass during
MHWs in North America

But a lot of single-species change

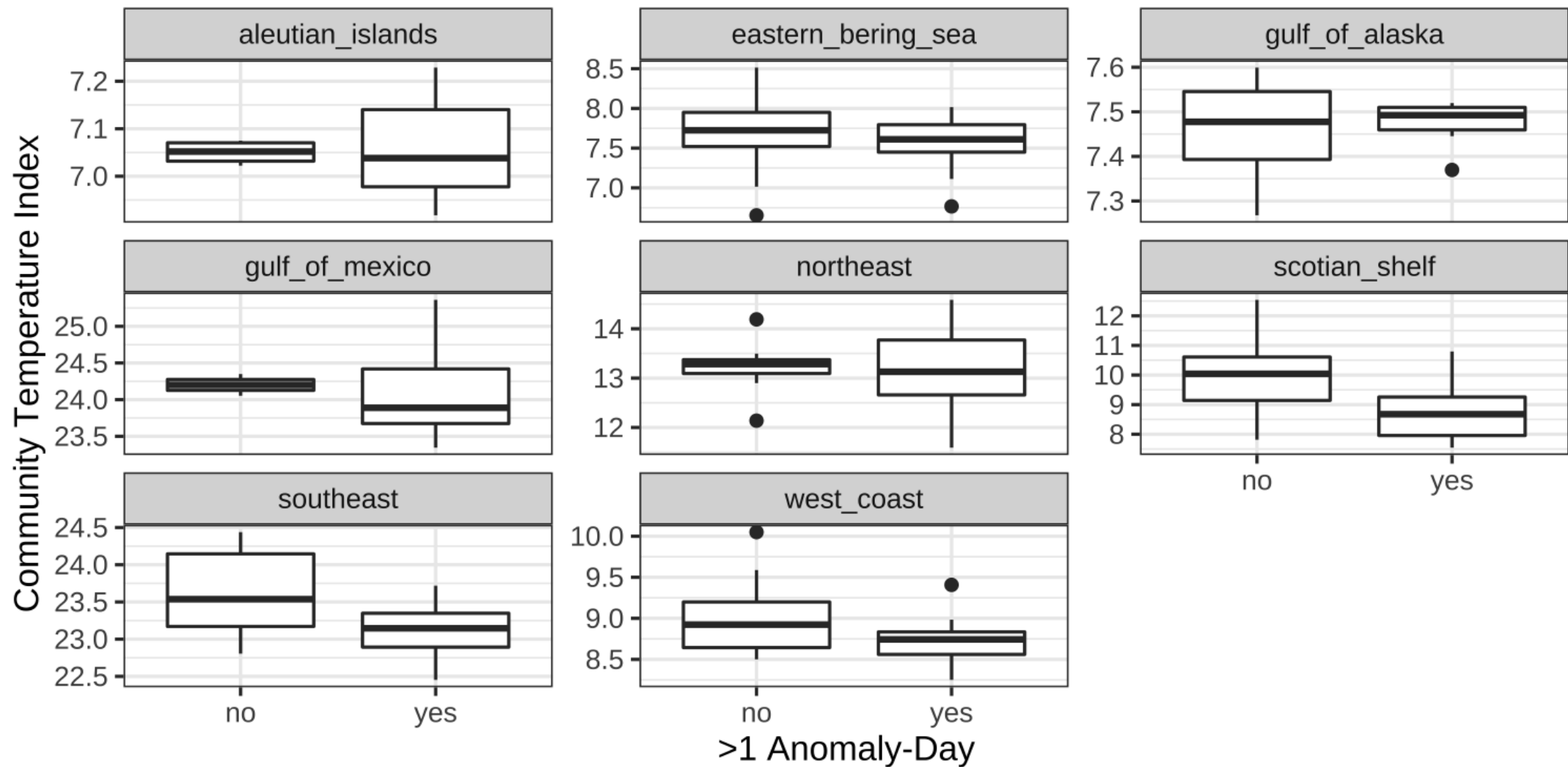
The community temperature index (CTI)

Get the realized thermal niche of all species in a region

Take the average, weighted by biomass

Used as a metric of "thermophilization" or "tropicalization"

Data from [Mike Burrows and friends](#)



Distribution of CTIs in MHW-Years vs. non-MHW Years

Next steps

- Refine CTI analysis, be sure included species are representative
- Focus in on "famous MHWs"
- Incorporate all trawl surveys! (May switch to different index of biomass)
- Test categorical MHW bins (like hurricanes)?
- Taxonomic checks?

Thanks!