GOA Pollock

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September 2021 GOA Plan Team

Plan for assessment in 2021

- I am the new lead this year, Martin will assist (phased retirement)
- Data updates:
  - 2021 fishery catches + 2020 ages
  - 2021 Shelikof indices + 2021 ages
  - 2021 NMFS BT index (no new ages)
  - 2021 ADF&G index + 2020 ages
  - 2021 Summer acoustic index
- ESP will be a scorecard update
- I use previous PT/SSC comments to guide future research models

NOAA FISHERIES
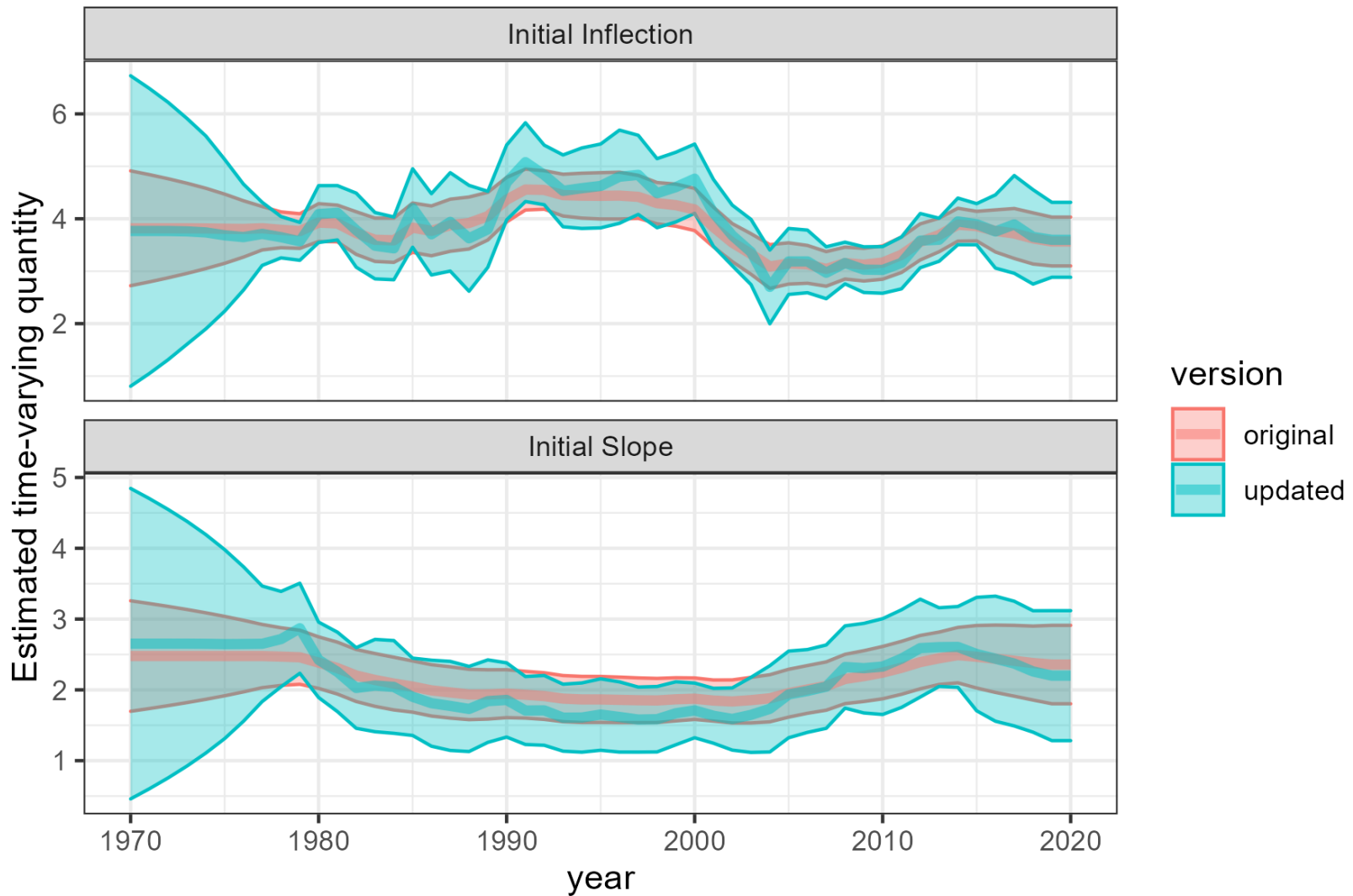
Plan Team and SCC comments

- The **Nov 2020 GOA Plan Team** "*recommended that authors of assessments with fishery data that have EM participants meet with existing EM committees to determine which biological data would need to be collected to inform assessment.*"

- We appear to get sufficient biological data from EM

Improving fishery selectivity

The Nov 2019 GOA Plan Team "*recommended the author examine fishery selectivity, as persistent patterns in the catch-at-age residuals may represent artifacts of the selectivity functional form used.*"
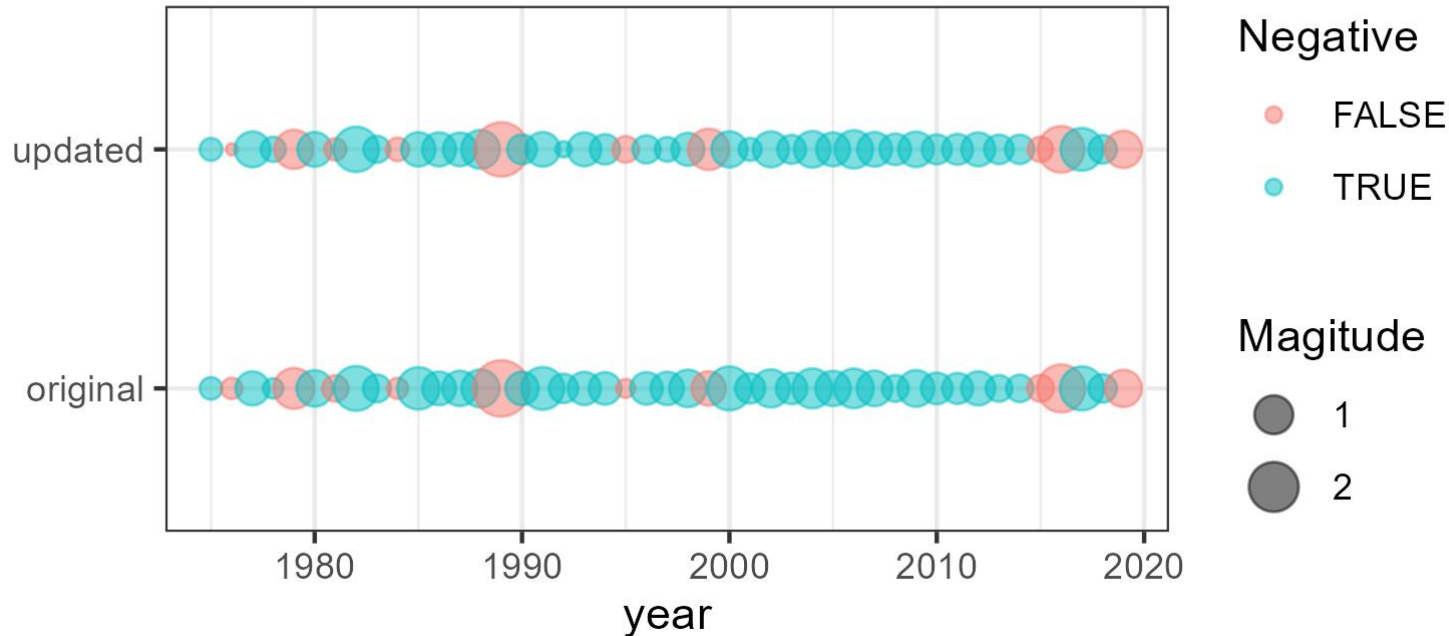
- There are consistent negative residuals for age 4s
- Selectivity is a double-logistic with time-varying initial inflection and slope.
- We tried allowing more RW flexibility

Improving fishery selectivity

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Improving fishery selectivity

Pearson residuals for age 4s

…But it did not really help

Does the PT have advice on functional forms to explore?
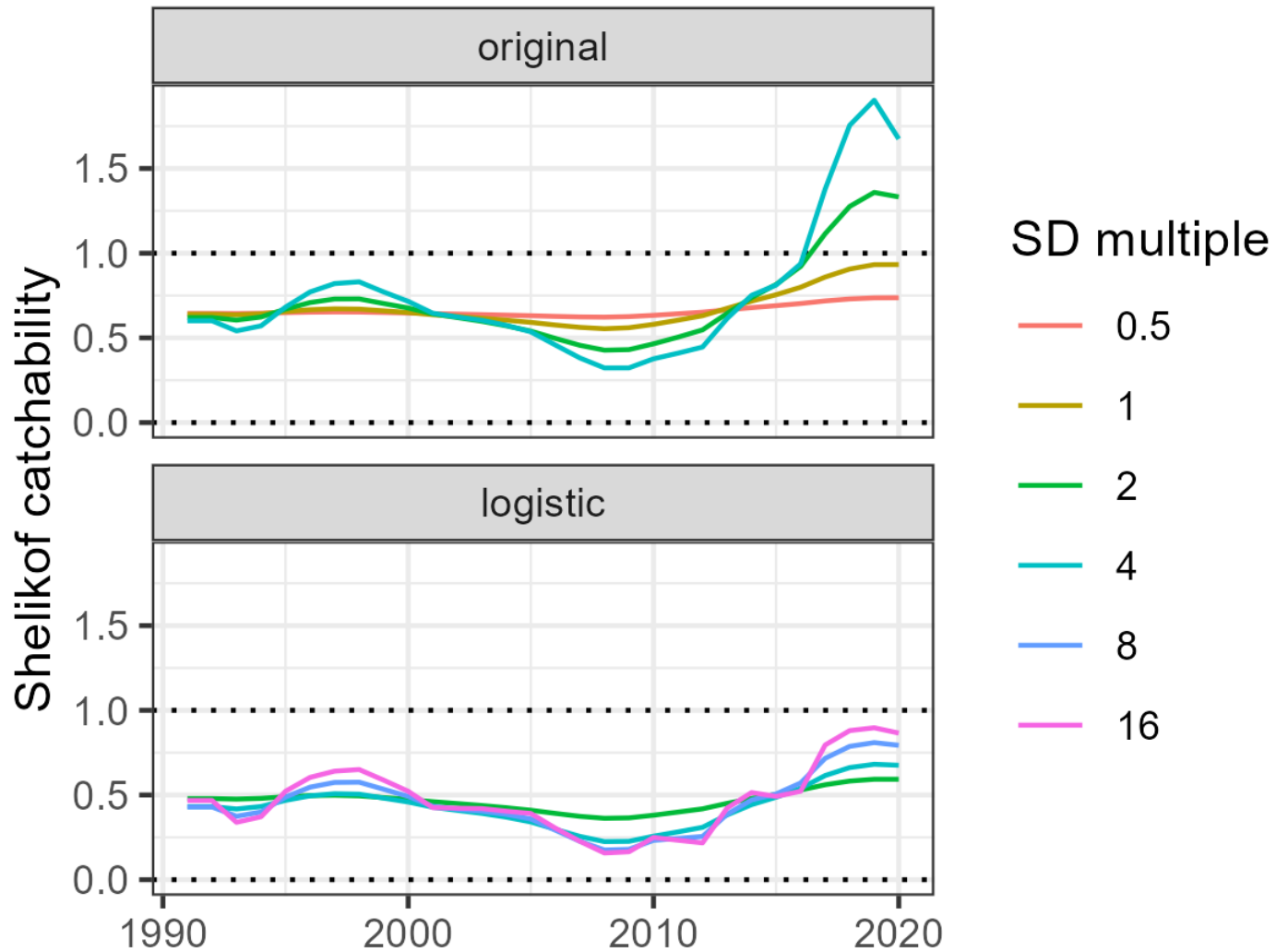
Constraining Shelikof catchability

Nov 2019 GOA PT *"recommended the author explore better methods for constraining the time varying catchability parameter to be under 1 for the Shelikof Strait acoustic survey."*

-Catchability reflects spatial availability because not all fish will be in Shelikof Strait during time of survey, thus $0<q<1$ is expected
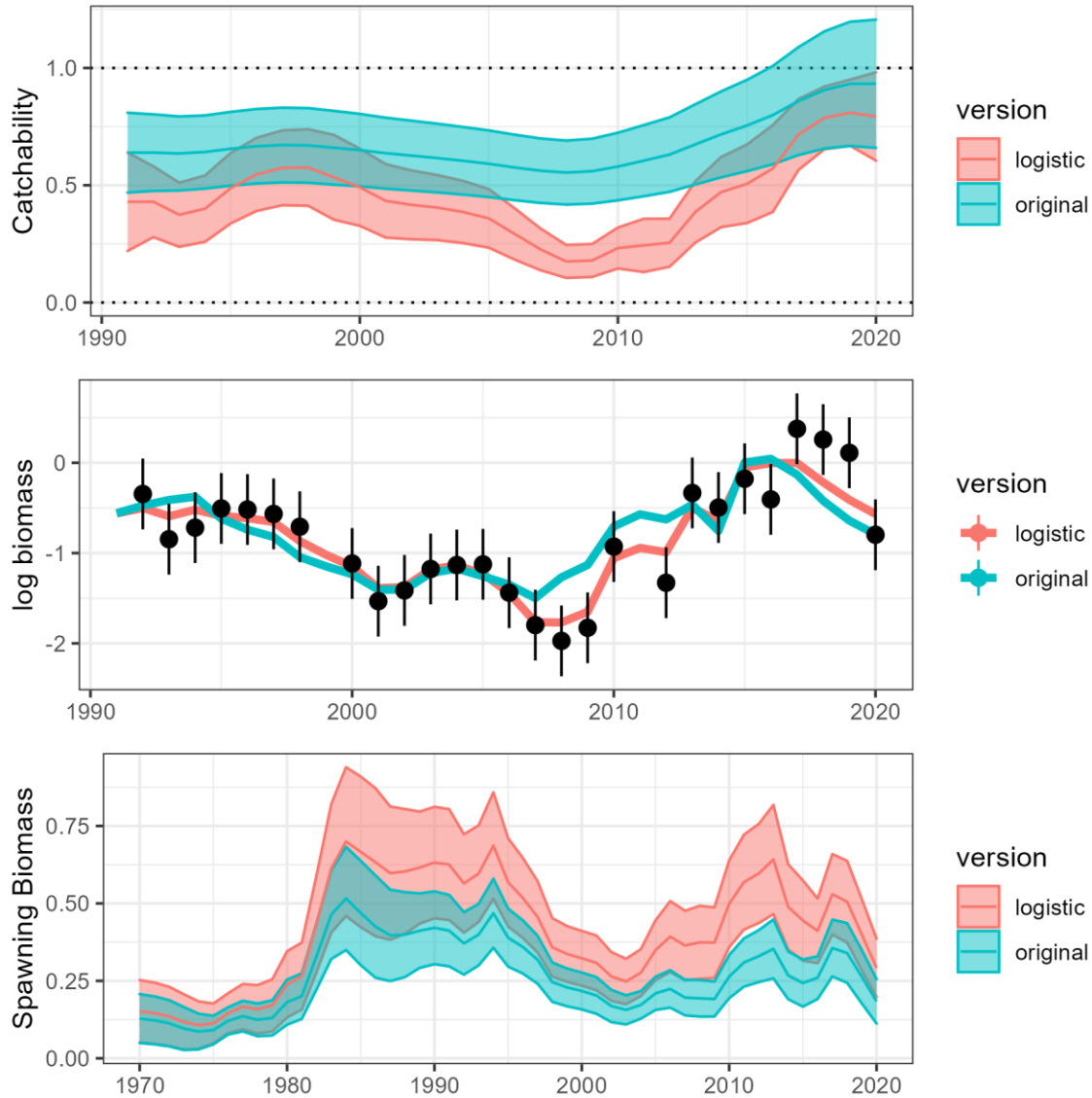
Constraining Shelikof catchability

- Catchability is for age 3+ fish (1 and 2 separate)
- Current model uses random walk in log space, with input SDs by year
- Updated model to use logistic function ($1/(1+e^{-x})$) to bound q between 0 and 1
- But, the deviations have a different interpretation
  - Need a much large input SD for equivalent flexibility
- A similar trend is estimated, albeit a slightly different absolute catchability

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Constraining Shelikof catchability

Constraining Shelikof catchability

Constraining Shelikof catchability

- The logistic constraint seems to work well and **I propose adopting that for this year**
- As always, tuning the assumed process error is important, but subjective
- A move to a state-space model could help here, or other techniques
- See also work on survey timing and catchability
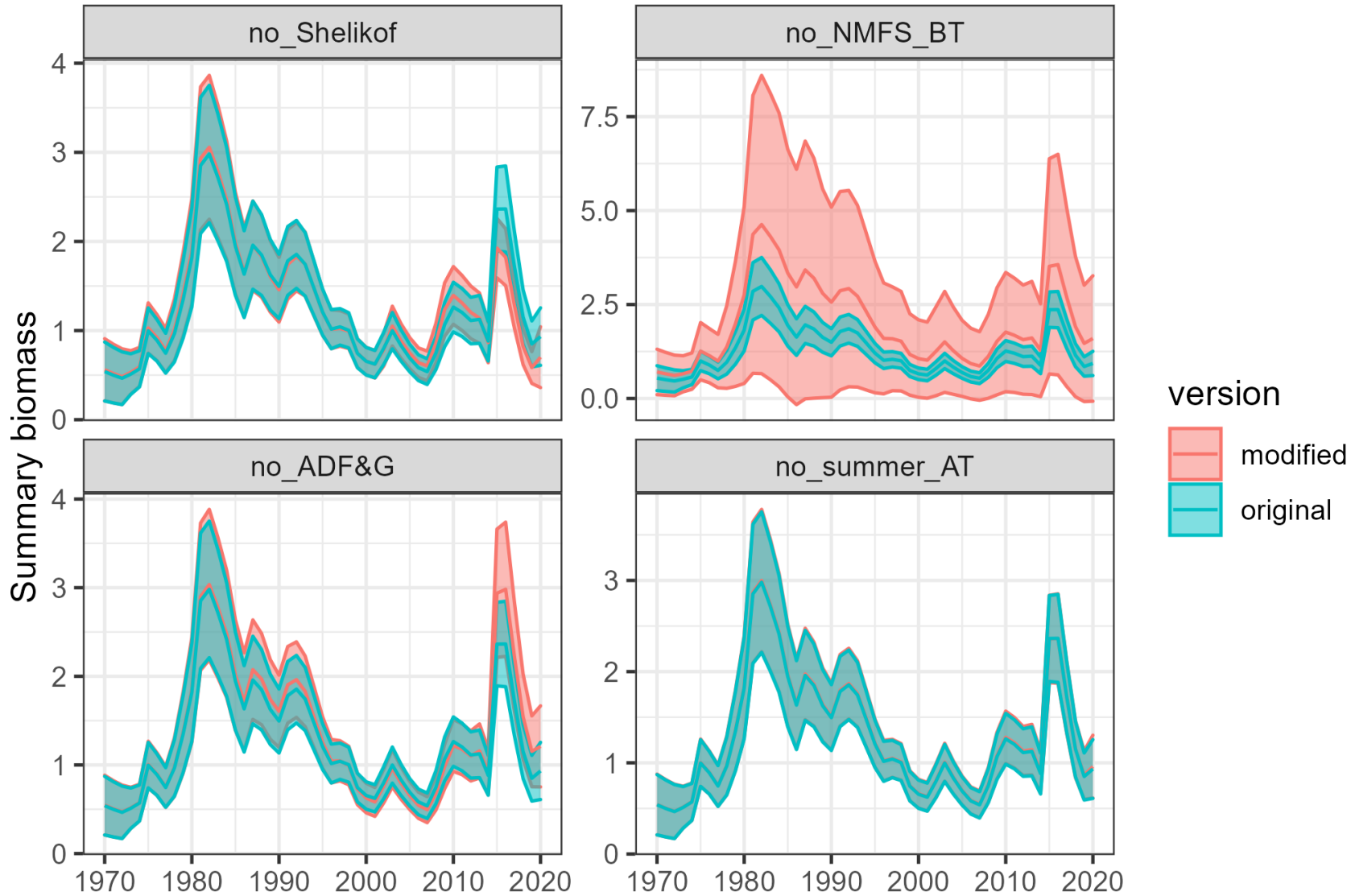- **Does the PT agree w/ this as an improved approach?**

Effect of dropping surveys

Nov 2018 GOA PT *"The GOA plan team in its November 2018 minutes recommended investigating model behavior sensitivity to abundance indices by incrementally dropping survey indexes to clarify how the data affect the model(s)."*
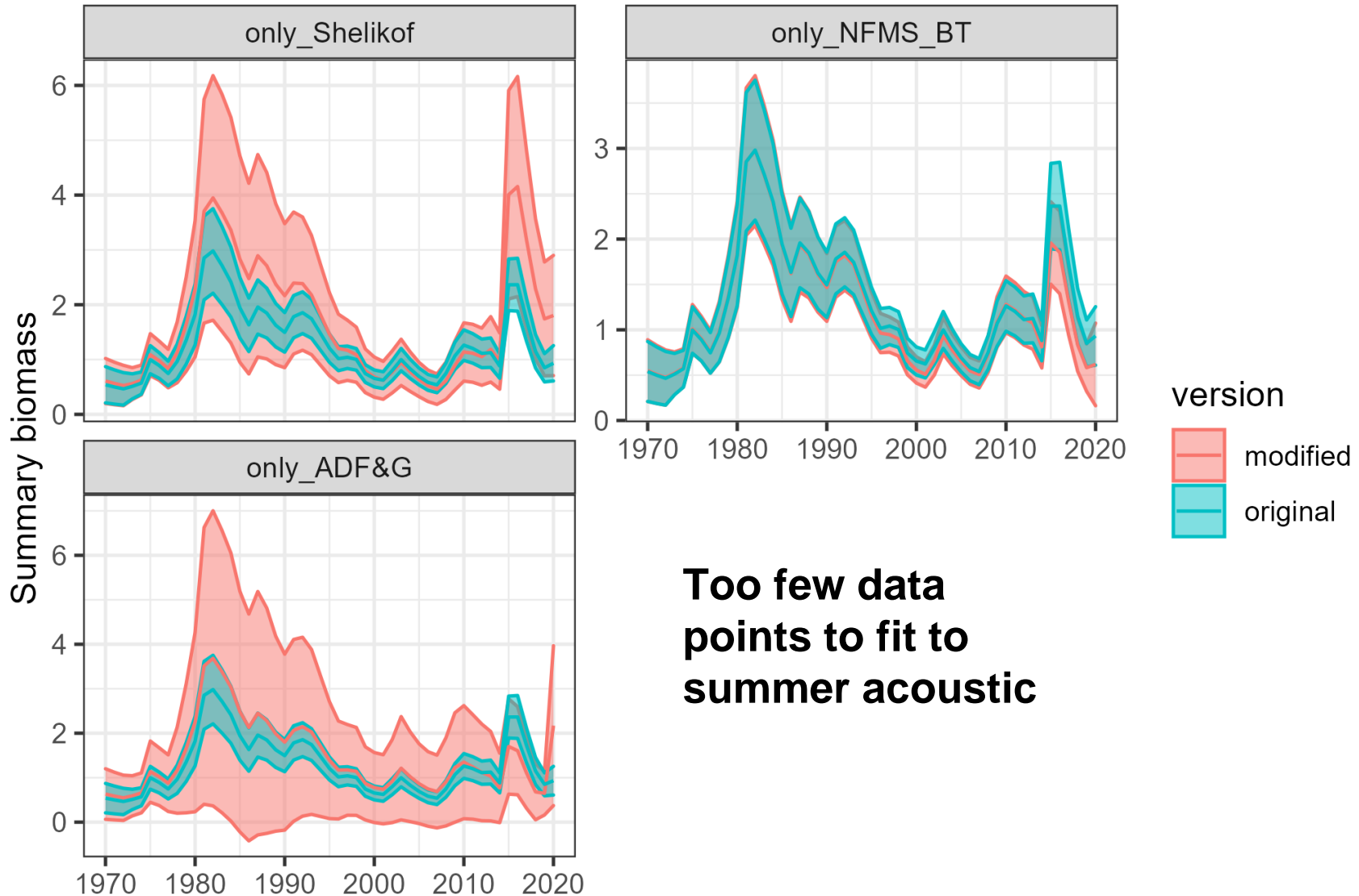
We approach this in two ways (2020 model)
1. Drop each survey one at a time
2. Drop all surveys except one

Effect of dropping single surveys

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Effect of dropping all but one survey

Too few data points to fit to summer acoustic

Effect of dropping surveys

- Consistent biomass trends across all scenarios
- Clearly the **NMFS bottom trawl survey drives the scale** of the model
- The summer acoustic has too few data points to affect the model (but a new point in 2021)
- Shelikof and ADF&G have contrasting recent trends which seem to cancel out
- Shelikof suggests much higher recent biomass

Investigating population scale

- Many parameters affect scale
  - Natural mortality (age-based, fixed)
  - Survey catchabilities
  - Log mean recruits

- These interact in complex ways

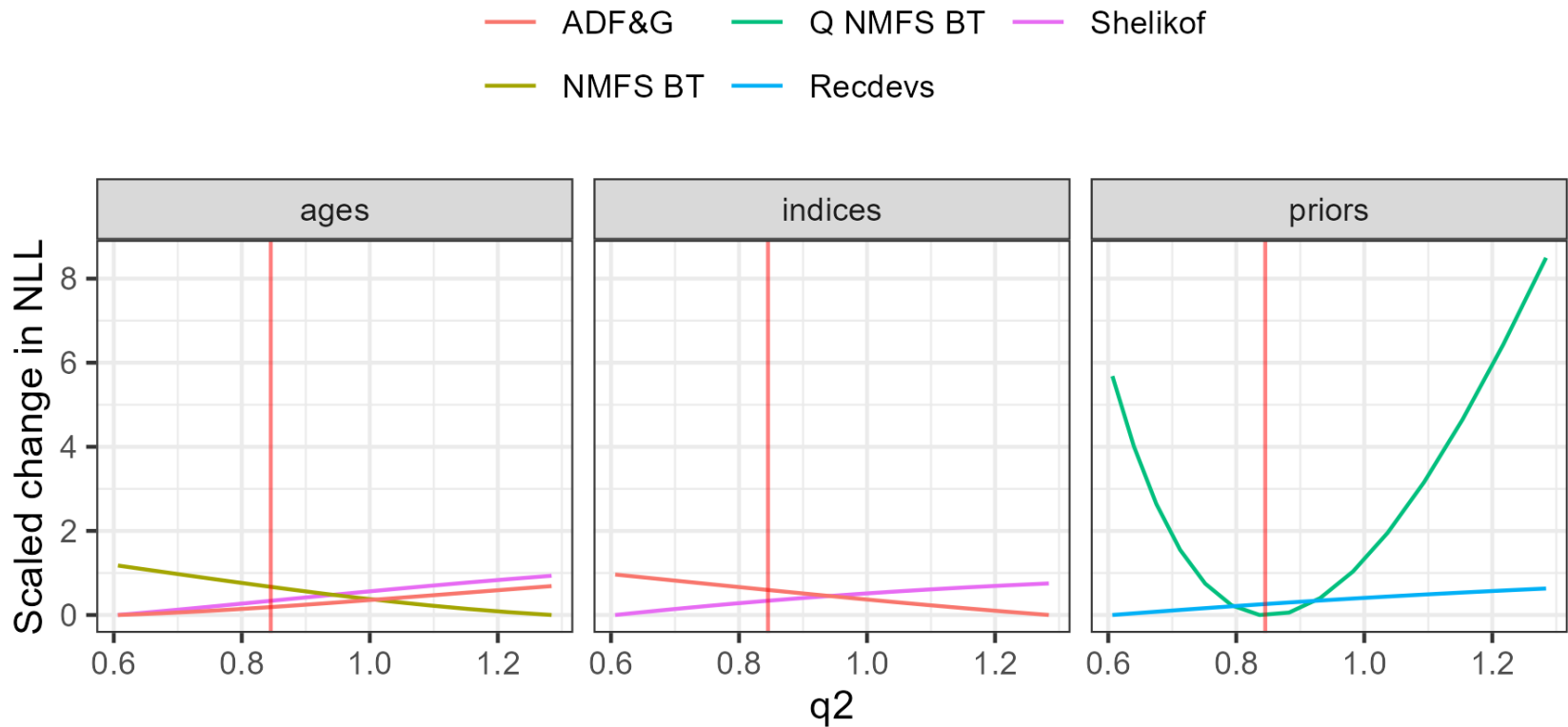- Likelihood profiles can help understand information sources for scale

Investigating population scale

- Profile over R0 shows conflicting scales
  - Among and within surveys
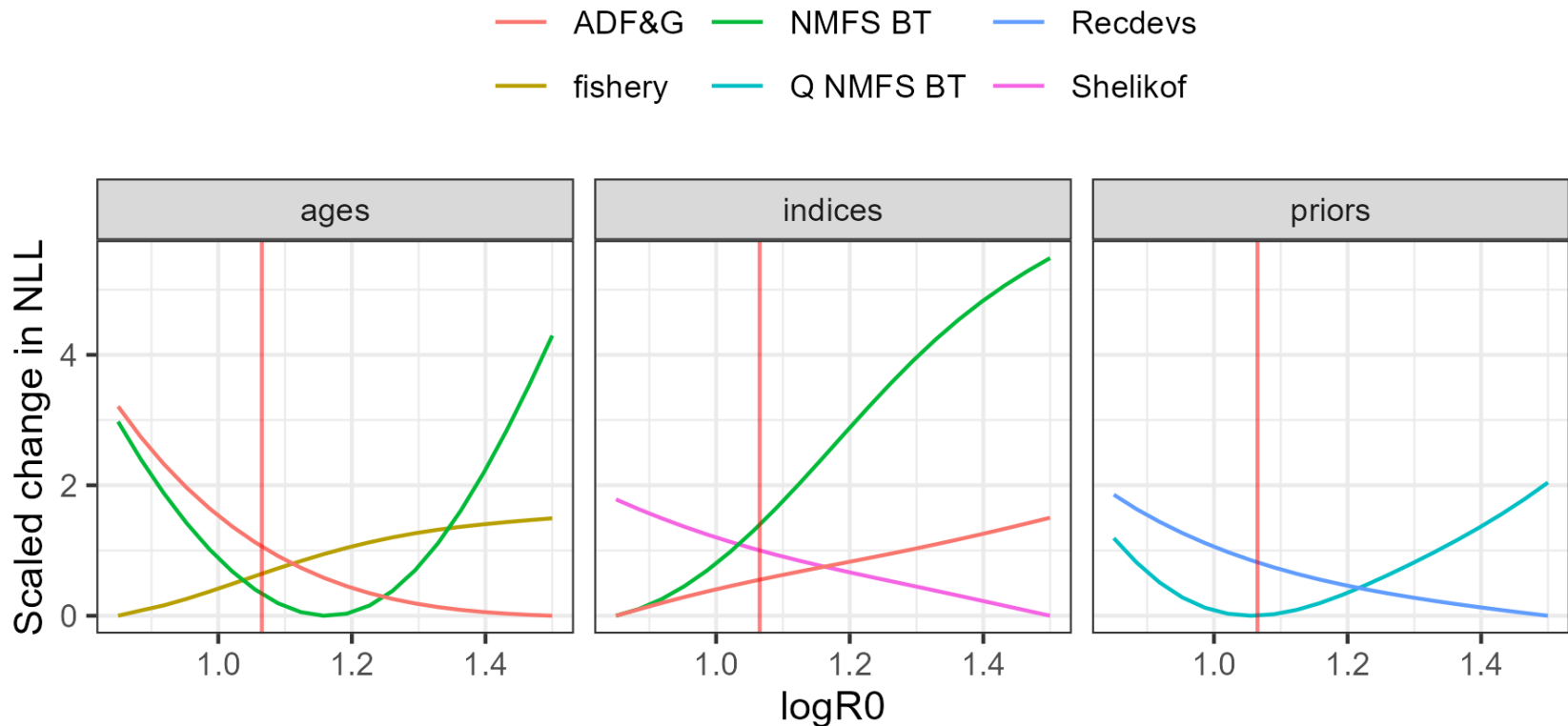
Investigating population scale

- NMFS BT catchability driven entirely by prior

Investigating population scale

- Profiles over M and Shelikof catchability showed similar conflicts
- These parameters interact in complex ways
- **Should I revisit the NMFS BT prior?**
- **How does this interact with data weighting?**

| Source	Index CV	No. Age Compositions
Fishery	--	68
ADF&G Bottom Trawl	25%	16
NMFS Bottom Trawl	20%	8
Shelikof (age 3+)	20%	8
Shelikof (age 1)	45%	--
Shelikof (age 2)	55%	--
Summer Acoustic	25%	10

Shelikof survey timing

Dec 2020 SSC *""… explore the use of … timing of the survey to inform **survey catchability**.… As an alternative, the proportion of mature fish in the survey may also provide … information about survey catchability" and to "to consider the influence of survey timing … on **selectivity at size**. … One or both of the selectivity parameters (size at 50% selectivity and/or slope) could be modeled as a function of survey timing …"*

- Lauren Rogers continues to lead an analysis on survey timing and catchability
- I will investigate potential impacts on selectivity in 2022

Combine acoustic and bottom trawl

Nov 2019 GOA PT *"The GOA plan team in its November 2019 minutes recommended an exploration of combining the acoustic summer survey and the GOA bottom trawl survey using a VAST framework, similar to the approach used by Cole Monahan [sic] for EBS pollock surveys."*

- I consider this a long-term research goal
- Such an analysis would take considerable effort
- I will consult with RACE in 2022 about data feasibility, I can do the analysis
- **Is the suggestion to improve the index, or learn about spatiotemporal vertical availability?**
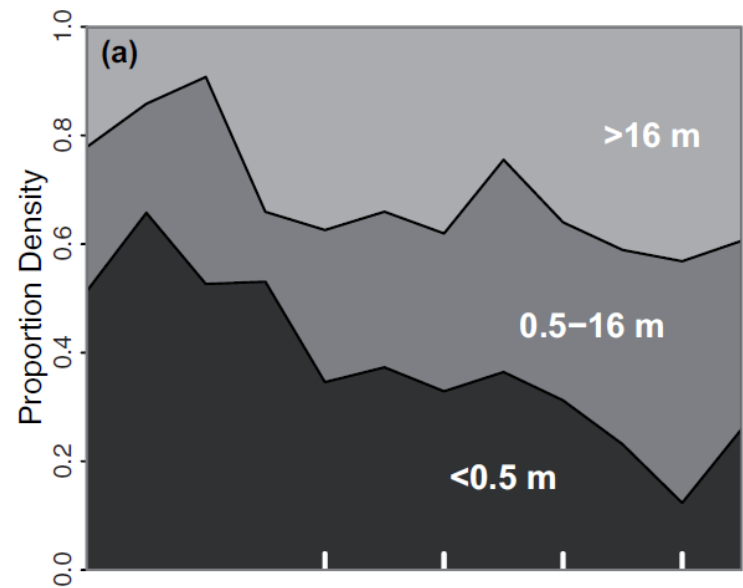
Monnahan et al. (2021)

Plan Team and SCC comments

- **Dec 2020 SSC** *"...explore ways of incorporating these new [maturity] estimates into the model to the extent possible, or at least continue including them in the assessment as an important population-level metric."*

  -These new maturity estimates are included in the model

- *"The strong trends in weight-at-age ... remain a concern in the assessment and the SSC encourages further research on the possible causes of these trends, including possible density-dependence and environmental drivers."*

  -I am co-PI on grant looking at climate-linkages to variation in growth using a state-space assessment framework