

# Data Moderate 2021 Model Notes for Copper Rockfish, Quillback Rockfish, and Squarespot Rockfish

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## Model Meeting 12.17.2020

### Copper rockfish

#### South of Pt. Conception

- Examining model “7.1\_data\_rec\_len\_add\_trawl” which has Linf and maturity fixed at coastwide values.
- Changing Linf and Maturity strongly impacts how pessimistic stock status is.
- Recreational selectivity being estimated as selecting small fish, less than the 50% maturity size, and dome shaped. The dome is exploratory and may be pinned to be asymptotic later.
- The bump up in the time series around 2015 is due to recruitment with a series of positive devs from 2008-2014. Without rec devs the fits to the lengths really degrades and over-estimates the mean length by year.
- HKL index fairly noisy or/and uninformative but the length data from this fleet are showing that the larger fish are out there.
- This model is applying francis data weighting
- The trawl survey is just there and data are not fit well.

To Do - Explore starting from a more drastic rec dome to see if estimation changes. - Email Gerry

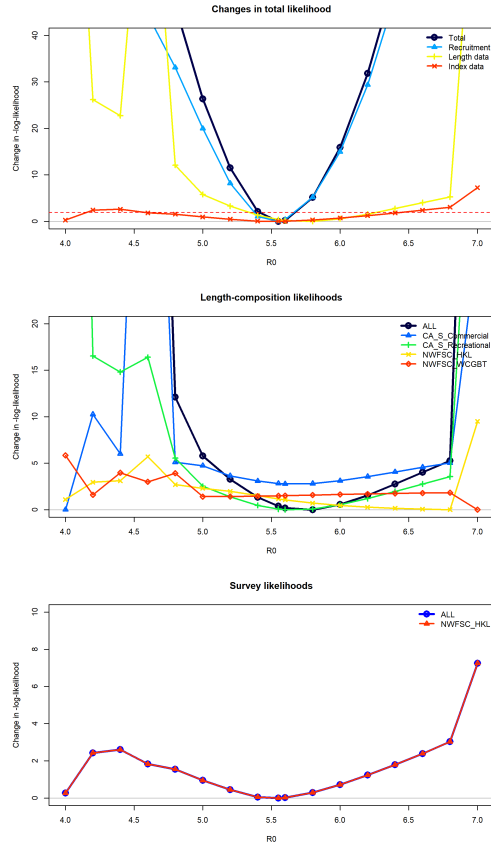


Figure 1:  $R_0$  profile for CA South copper rockfish.

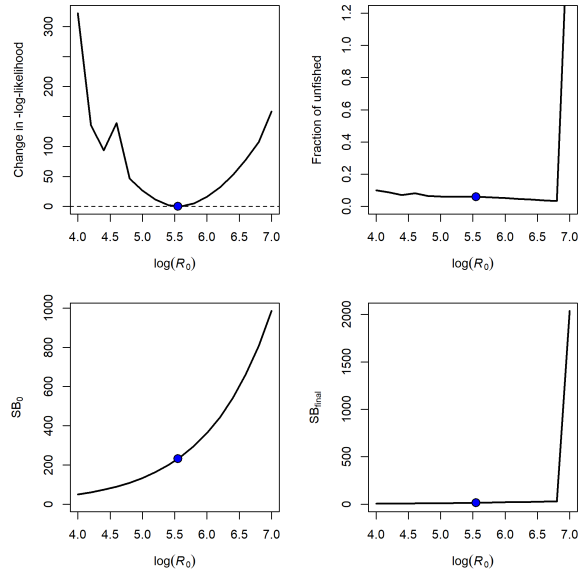


Figure 2: Parameter profile for CA South copper rockfish.

## North of Pt. Conception

- Examining model “5.1\_data\_rec\_len\_trawl\_survey”
- Blocked commercial selectivity shifting to smaller fish in recent years (2009+). The change in mean length was not able to be explained fully due to strong recruitment.
- Really clear evidence of a strong ~2008 recruitment and without devs poor mean length fits and residual patterns. However, the size of the rec dev in ~2008 is resulting in a strong uptick of the stock (above target) and without in the precautionary zone.
- DM data weighting

To Do - Shorten the rec devs time series.

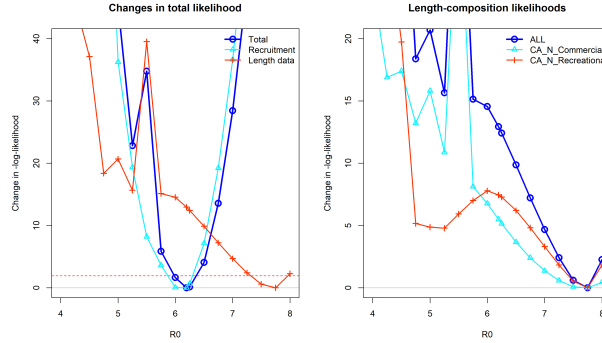


Figure 3: R0 profile for CA North copper rockfish.

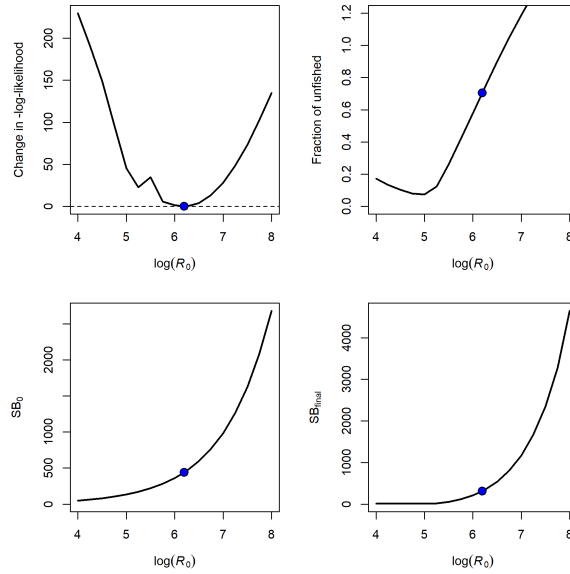


Figure 4: Parameter profile for California North copper rockfish.

## Oregon

- Examining model “2.4\_recdevs\_early\_est\_p1\_only\_block”
- Recreational selectivity blocked periods: start - 1999 and 2000 - end.
- Released fish - I had not initially included these lengths (I think I looked at the CA released lengths which were really small) but adding these few lengths in as a ghost fleet show that they are not really different from the retained fish (when there are more than a few samples in a year). We should talk with Ali more about why an angler would release a fish on a trip.
- There does not seem to be enough information to estimate rec devs however without devs the stock is estimated unfished with a large  $R_0$  and with devs on estimated in the precautionary zone with a much more reasonable  $R_0$ .

To Do - Remove block for the current model. - Add age data and see how the recruitment changes. - Check  $\log(R_0)$  black rockfish, china - central  $\sim 4.5$ , china north  $\sim 3.5$ , and blue rockfish.

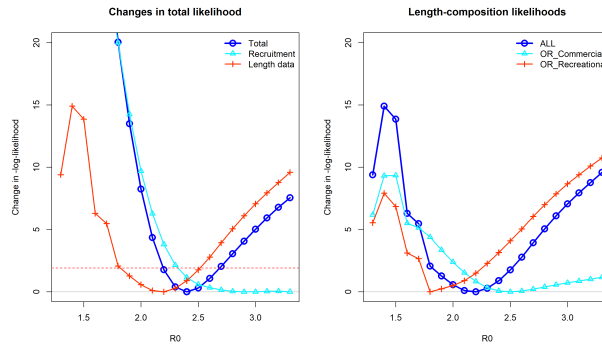


Figure 5:  $R_0$  profile for Oregon copper rockfish.

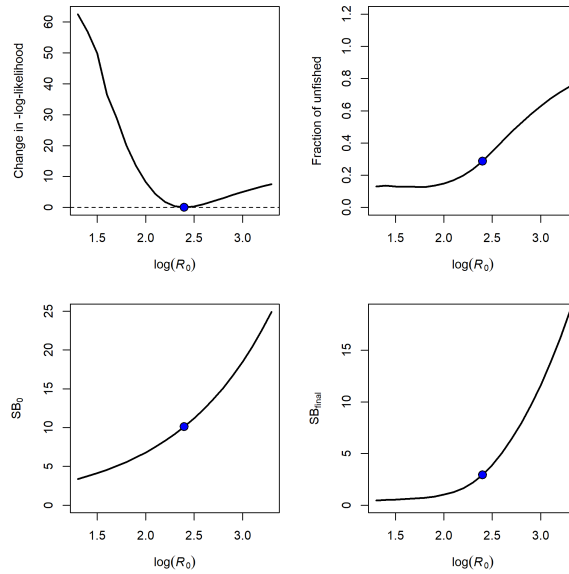


Figure 6: Parameter profile for Oregon copper rockfish.

## Washington

- Looking at a model without rec devs “5.1.1\_selex\_cv\_fixed”
- While allowing domed-selectivity there is likely little impact of this and will likely be pinned asymptotic.
- Estimating rec devs vs. not results in fairly dramatic model differences. The rec devs are likely being driven entirely by the catches rather than information in the lengths. When estimating rec devs there are some very large series of recruitment around 2000 and then all negative for the years after. There is a trade-off between recruitment and selectivity where: No devs -> left shifted selectivity, Rec devs -> right shifted selectivity
- Apply francis data weighting.

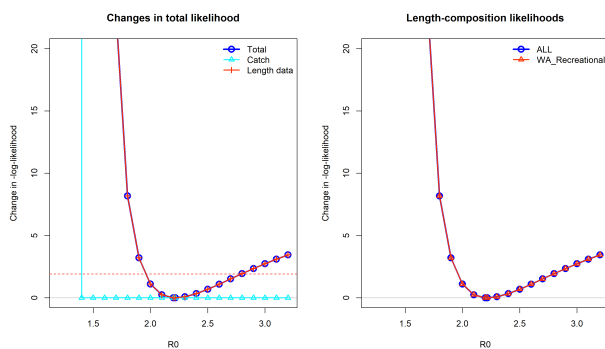


Figure 7: R0 profile for Washington copper rockfish.

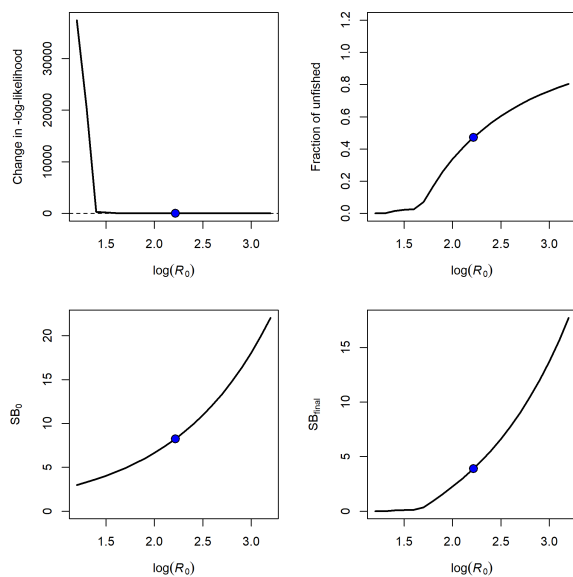


Figure 8: Parameter profile for Washington copper rockfish.

## Quillback rockfish

### California

- Period of high recruitment in the 1990s followed by a dip in recent years. These patterns appear to be really driven by the catch.
- Possible sensitivity - apply a smoother through the catch time series and evaluate what the model does to recruitment. In theory, the removals should be similar applying a smoother but would allow you to possibly decouple recruitment and catches.

### Oregon

- Seeing really large recruitment around 1997 and again possibly around 2013 which are supported by the length data.

### Washington

- Recruitment devs appear to be tracking catches with catches spiking in select years.
- Francis and MI data weighting has been explored so far, but not DM yet.
- The recruitment deviations are likely also being driven by an increase in mean lengths in recent years which the model is explaining by having a string of negative recruitments.

## Squarespot rockfish

- Examining model “2.4\_rec\_devs\_2010”
- Max age set at 34 based on 95% quantile of ages
- Tried restricting rec dev estimates to only the recent years based on some estimates in early years that look uninformed. The challenge of estimation here appears to be that we don’t see small incoming fish (likely because they are small even when “grown”), however, there does appear to be a change in the population based on the hkl index and a slight change in mean length between 2016-2018. Without rec devs the model estimates a fairly unfished stock up until recent years where catches have spiked which does not fit the hkl index (flat line).
- NWFSC HKL index shows a sharp increase between 2015-2018
- Francis weighting applied so far (not re-weighted with the most recent runs).
- No rec devs:  $R0 = 6.6$ ,  $SB0 = 40.9$ ,  $Depl\ 2021 = 0.65$ ,  $Catch\ spr = 20.8\ mt$
- Only recent devs:  $R0 = 5.5$ ,  $SB0 = 13.1$ ,  $Depl\ 2021 = 4.8$ ,  $Catch\ spr = 6.9\ mt$

To Do - Double or triple the lambda on the composition data. - Try the DM - Change the min max rec devs allowed in the ctl - Reduce sigma R back to 0.60.

# Model Meeting 1.4.2020

## Copper rockfish

### South of Pt. Conception

- The recreational data and the NWFSC Hook and Line data seem to represent separate sections of the population. The area of the survey is a location that likely gets little recreational fishing due to travel time from shore. The recreational data indicates a very depleted stock, while the survey data indicates a “healthy” stock.
  - Put more weight on survey data and less on recreational data (MI) with dome shaped selectivity ~ 25%.
  - Put more weight on survey data and less on recreational data (MI) with asymptotic selectivity ~8%.
  - Put more weight on recreational data and less on survey data (francis) with dome shaped selectivity ~8%.
  - Put more weight on recreational data and less on survey data (francis) with asymptotic shaped selectivity ~3%.
- Early commercial lengths mean lengths are a fair amount greater than expected. These years have limited sample sizes (1983 - 1994, 9 years total).
- To Do:
  - If we think HKL is not representative of the population then we should not be using it to be representative.
  - If we assume that the HKL is representative of the population, how do we get the recreational fleet and the survey to agree. Profile across the p6 parameter determine where they depart. Create two separate models 1) hook & line only and 2) recreational only. How severe does the dome shape need to be for the recreational model match the hkl model? Running the rec model only will be the easier one. Questions to ask 1) what does the rec dev look like without hkl data?

### North of Pt. Conception

- “Base” model (9.0\_base)
- Block in recreational selectivity with a right shifted peak through 2008. Both periods are asymptotic.
- Recruitment deviations estimated. Considerable adjustment in the main vs. early start years was needed due to a series of negative rec devs at the start of the initial main years which resulted in even higher positive rec devs later on. The key was removing the early recreational length (1983-1986, 4 years total). The fish observed during this period were greater than all other years which led to the model estimated recruitment failures preceding the start of the data. An alternative if these data are to be believed would be to implement a block in selectivity.
- To Do
  - Block in early recreational selectivity based on the currently removed data.
  - Do additional explorations to understand the influence of the commercial data. Could do the lambda block to reduce the influence of these data. Also, look at fixing late block to match early block and/or look at the selectivity for the unblocked model.

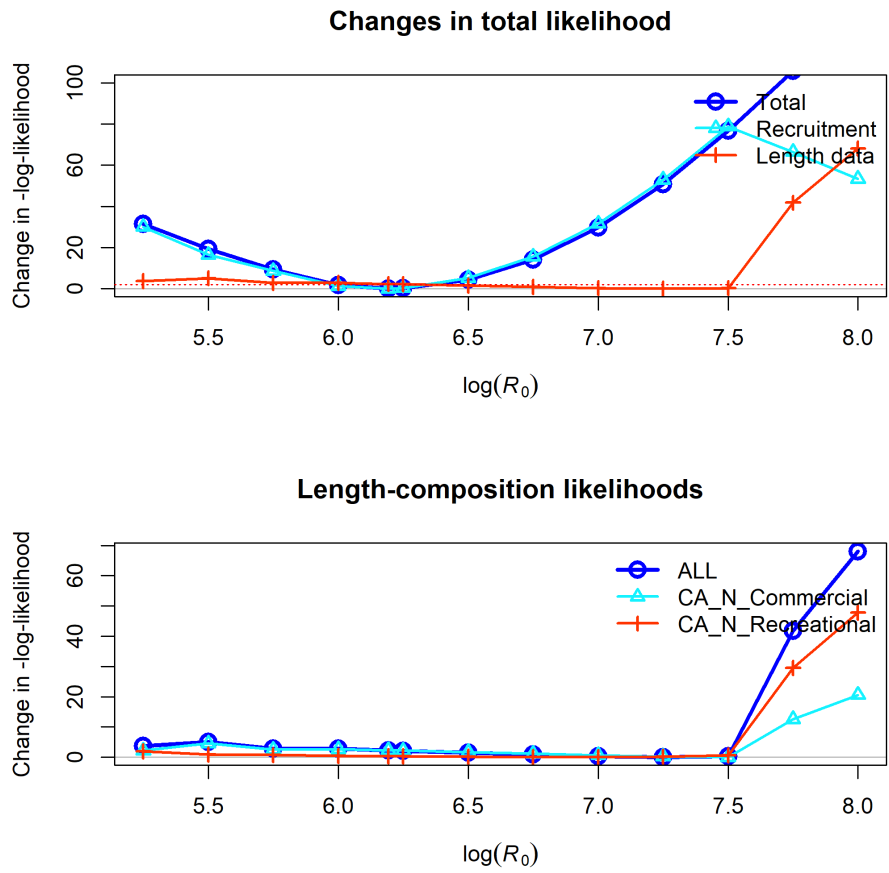


Figure 9: Parameter profile for Linf for copper rockfish California North.



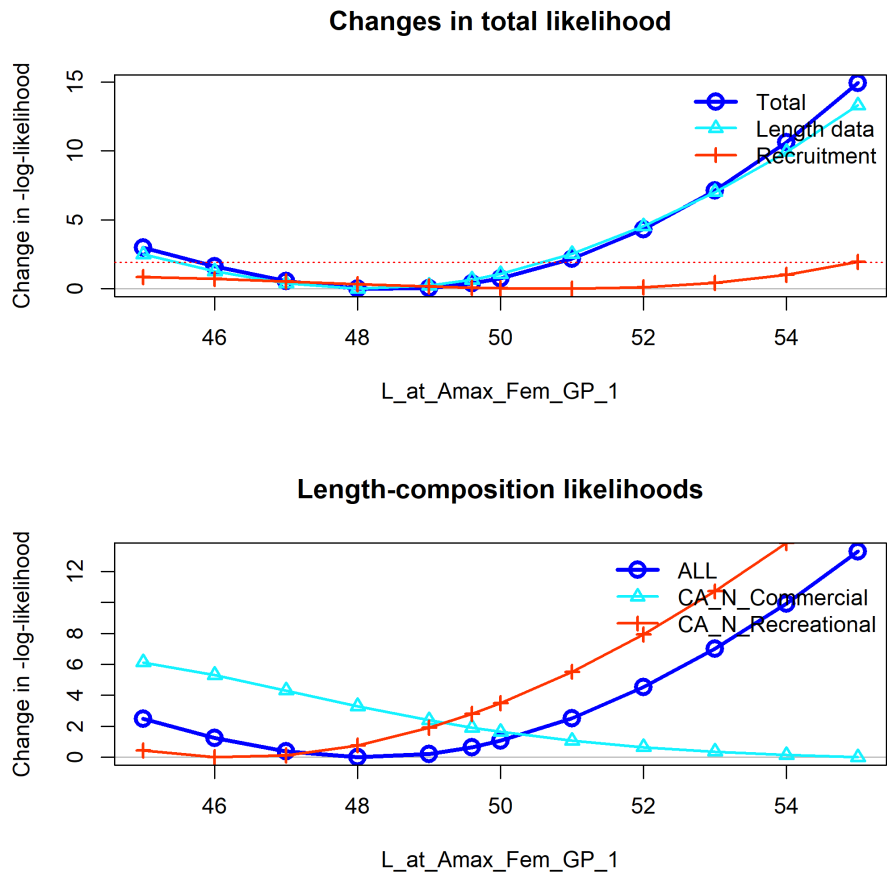


Figure 10: Parameter profile for Linf for copper rockfish California North.

## Oregon

- “Base” model (5.5\_dw\_francis\_sigmar\_60)
- Block on recreational selectivity with asymptotic selectivity through 1999 with domed selectivity in the period after 1999.
- Estimate recruitment deviations with the main period starting in 1980.
- Francis data weighting with sigma R = 0.90 vs. sigma R = 0.60 are similar but better NLL with sigma R = 0.90 by  $\sim 3$  units. In contrast the MIdata weightin under the two sigma R assumptions results in very different model results. Dirichlet data weighting is dramatically different relative to the other two methods.
- There seems to be some tension between commercial and rec lengths in terms of R0 which data weighting highlights.

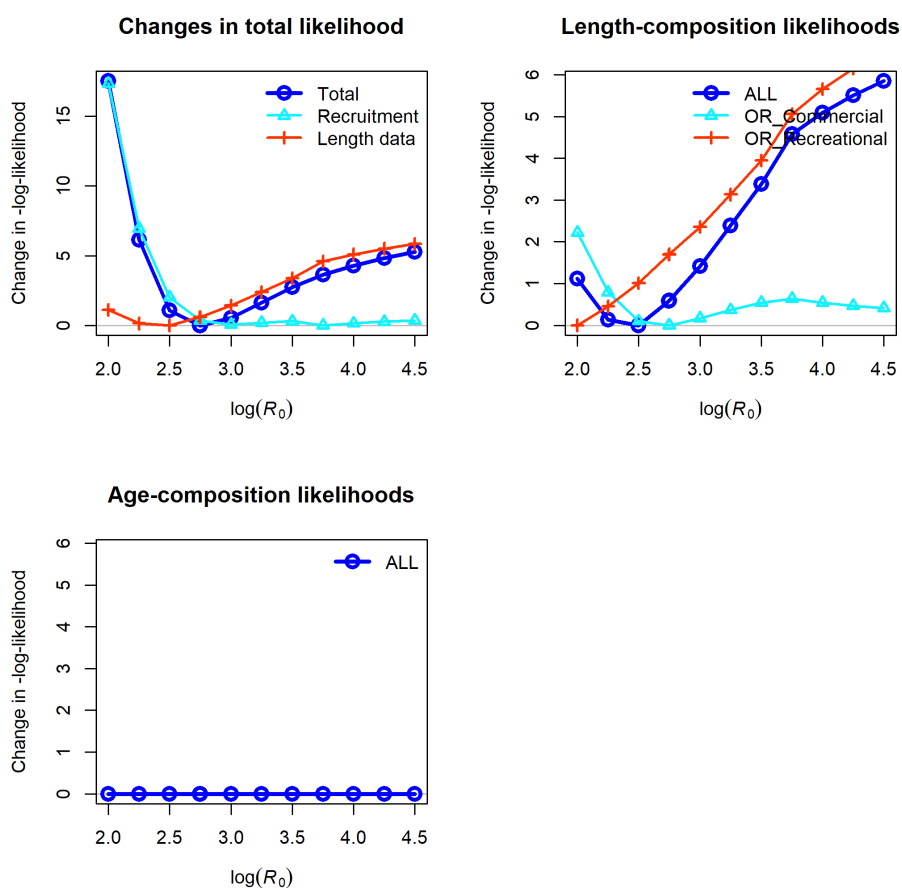


Figure 11: Parameter profile for R0 for copper rockfish Oregon.

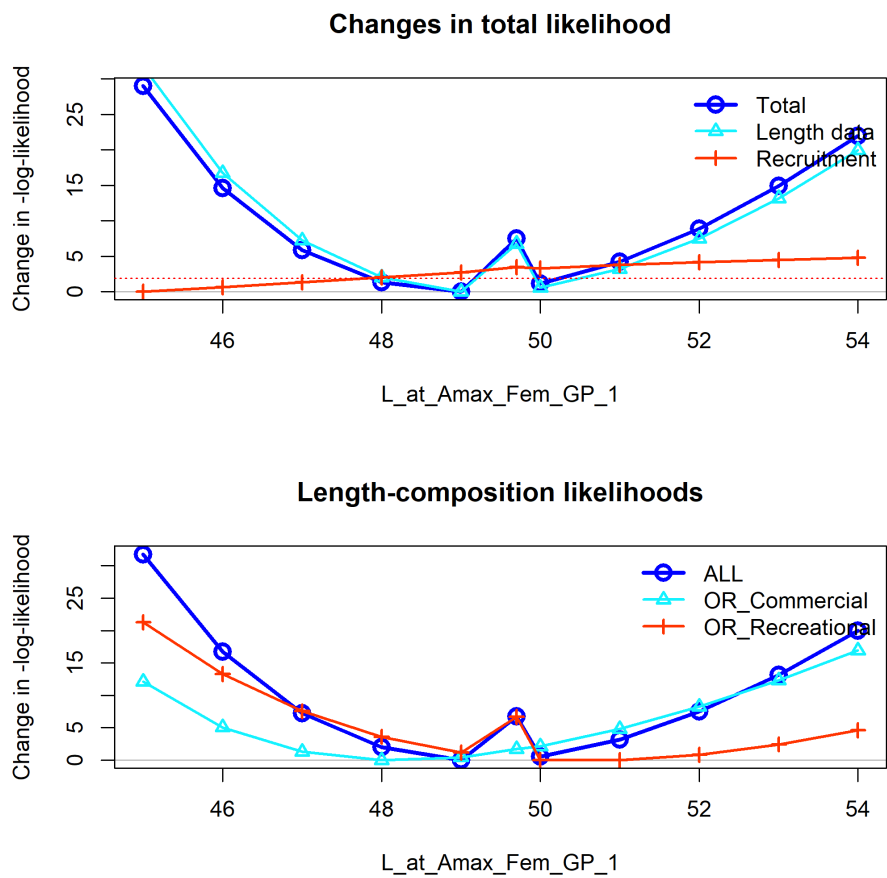


Figure 12: Parameter profile for Linf for copper rockfish Oregon.

## Washington

- “Base” model (7.0\_base) estimates asymptotic recreational selectivity with commercial selectivity mirrored. Recruitment is assumed deterministic due to limited data but a sensitivity is performed. Estimated parameters  $R_0$ , selectivity peak, and selectivity ascending slope.

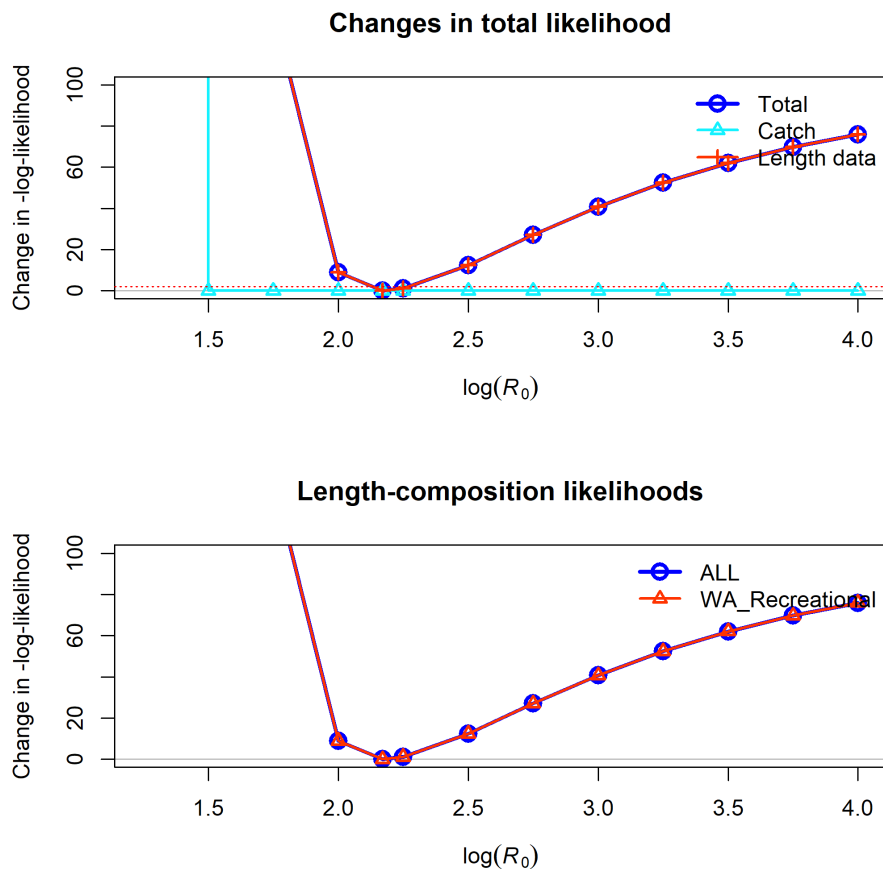


Figure 13: Parameter profile for  $R_0$  for copper rockfish Washington.

## Squarespot rockfish

- Model “2.5\_rec\_devs\_sigmaR60”
- Need to explore rec dev periods. All rec devs are being estimated as part of the “main” period.

## Quillback rockfish

Models available at “//nwcfile/FRAM/Assessments/CurrentAssessments/DataModerate\_2021/Quillback\_Rockfish/models/wa”. Code including a description of what models mean available at [https://github.com/brianlangseth-NOAA/quillback\\_rockfish\\_2021/tree/master/code](https://github.com/brianlangseth-NOAA/quillback_rockfish_2021/tree/master/code)

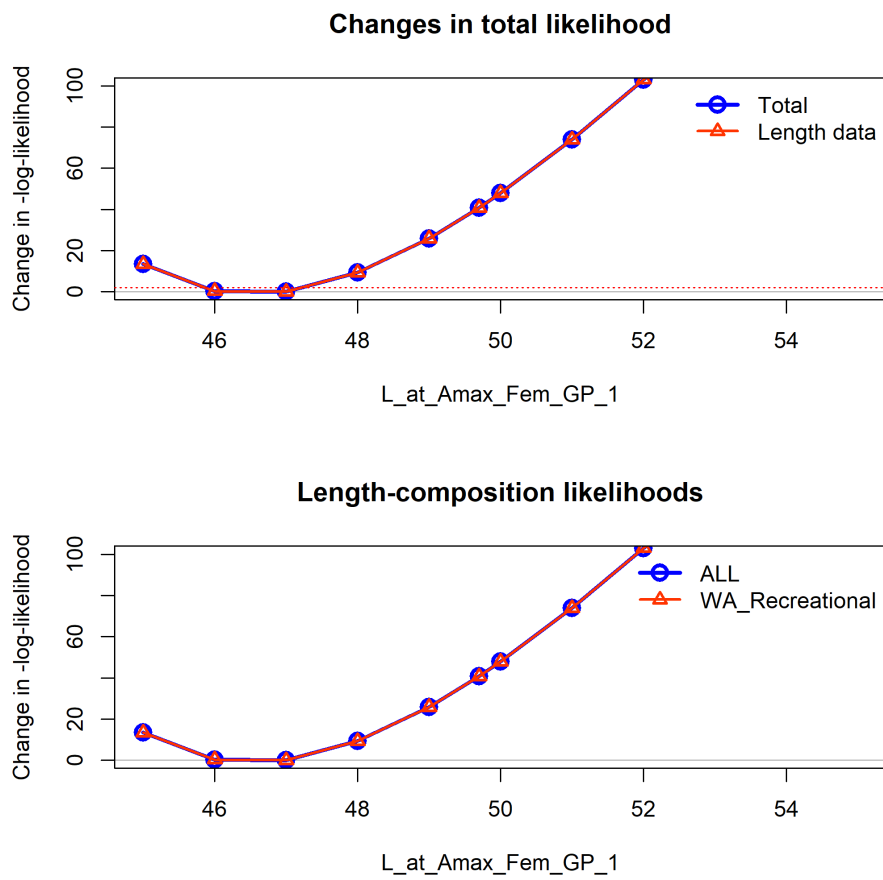


Figure 14: Parameter profile for Linf for copper rockfish Washington.

## California

- Surprisingly recdevs are not connected to catch as much as I thought
- `compare_catch_rec.R` is a simple function that plots catches with recruits with option for offset and catches aren't as connected

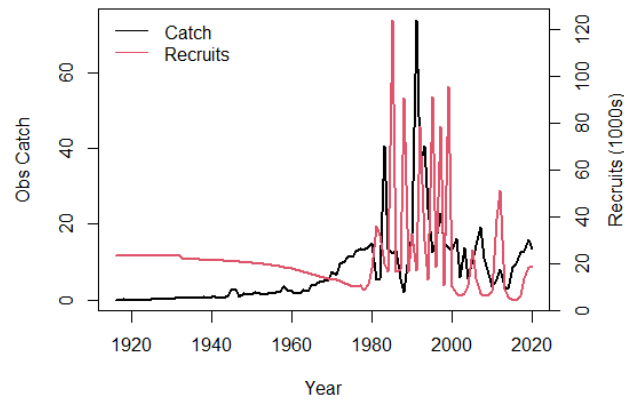


Figure 15: simple model with recdevs estimated.

- Better to use rdevs instead of recruits?
- Using a 7-yr moving average of catches also doesn't affect model like I thought it would

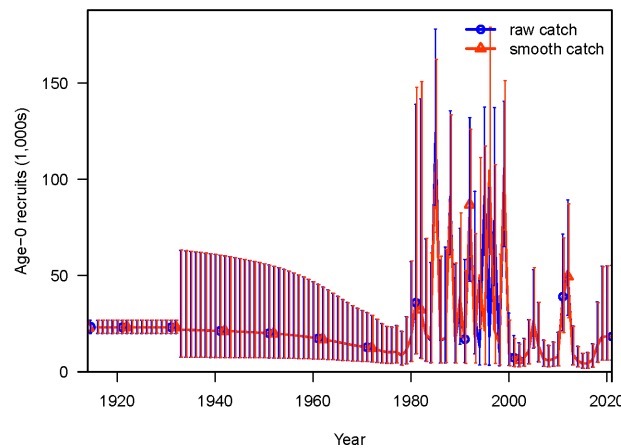


Figure 16: Comparing raw and smoothed catch.

- Can see the catch comparisons

## Oregon

## Washington

A few things to discuss

1. Rec bias adjustment - Do you iterate with `SS_fitbiasramp()`? There is some oscillation with 116 models
2. Rec devs - General tips on when to start? Whether to include early rec devs at all?

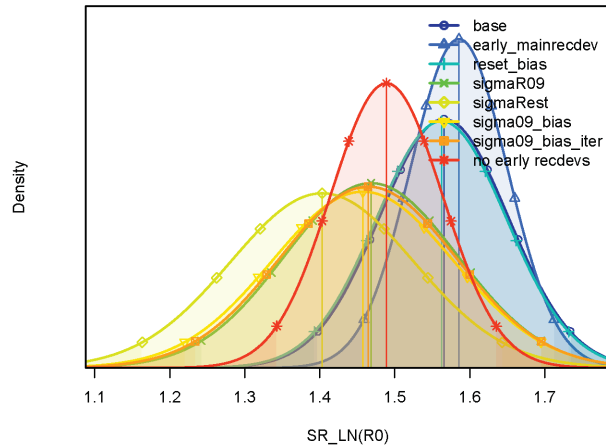


Figure 17: Comparing influence of rec devs and sigmaR.

3. Sigma R - WA models do run high. Estimating is unreasonable in my opinion (keeps hitting whatever bound is set. Ive gone up to 1.2). Higher sigmaR reduces rec magnitude (reduces R0). Right now Im going with 0.9 but no real basis for choice.
4. Dome shaped selectivity - Just allow estimation of  $p_6$ ? For me effect is not large (dome is at higher high lengths - and actually above my data bins). Washington didn't have obvious choice.
5. Ages - I added ages into my WA model. Then reweighted. Results are very odd. Thoughts on keeping ages
  - Ages only for 1998, 1999, 2000
  - Add lots of early meaningful recdevs
  - Weighting removes any information on mean length but fits age comps much better See “//nwc-file/FRAM/Assessments/CurrentAssessments/DataModerate\_2021/Quillback\_Rockfish/models/wa/plot” for comparison plots