STAFF RESPONSES TO PANEL REQUESTS

1st External Review of IATTC staff’s stock assessment of skipjack tuna in the eastern Pacific Ocean
La Jolla, California USA, 07-10 October 2022

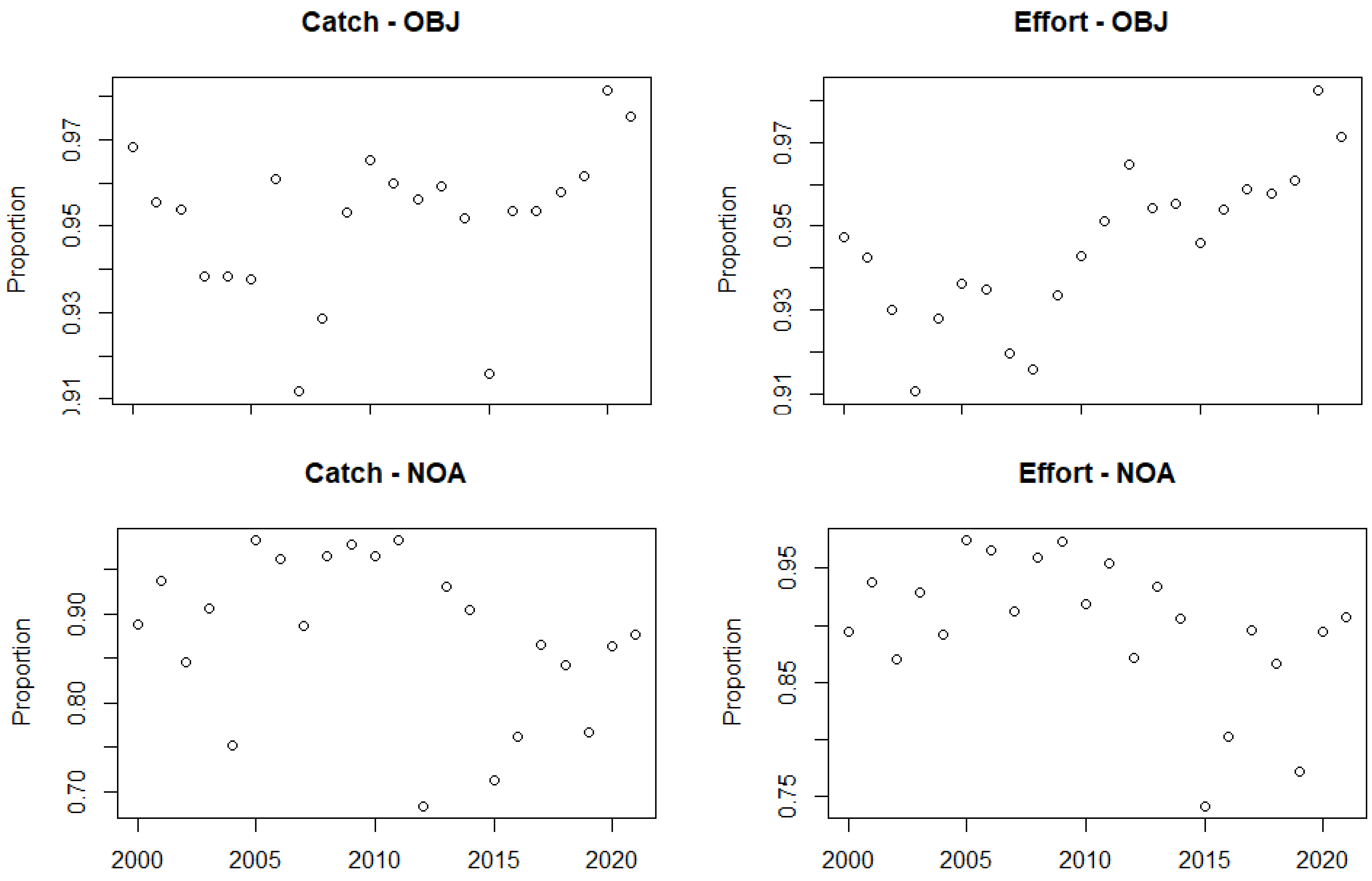
Data requests

- 1. Provide estimates of the proportion of effort and catch included in the grids used in calculating CPUE indices for Purse Seine by year. Rationale: These indices are being used to represent the entire stock but its conceivable that the spatial distributions change over time so that what appears as a change in abundance could be a change in the proportion of the fish in the included grids.
- 2. Provide alternative indices based on just raw catch/effort using all grids for purse seine. Rationale: This will illustrate how much the choices of leaving out grids (because of issues with including them in the model) and the adjustments being made by the model collectively are influencing the input indices of relative abundance.
- 3. Plot the standardized (Z score) of the nominal CPUE for Bigeye, SKJ, YFT. From longline fishery from Japan. Rationale to check if the SKJ catch fluctuations too tied to fluctuations of other species (high grading or targeting might produce such patterns)
- 4. Look at overlap of PS with LL and compare length compositions in data restricted to be where the LL and PS are both operating to see if large fish seen in the longline still seen in places where PS operates.
- 5. Calculate residuals for age comps adjusted to deal with negative correlation among ages for MN.

Model requests

1a. Refit the assessment models with the Lorenzen mortality with the scale estimated. Rationale: M might be different than assumed.
1b. Change the assumed growth model so age at 37cm to be 3 quarters. Still estimate M as in 3a..
1c. Change to the vonB with Linf and L at young age fixed and K estimated and estimate M as in 3a.
Concern that growth is higher below 40cm, M and growth could be confounded.
2. Fit the assessment model with a higher SE for log-scale catch. A value of 0.1 seems reasonable although using a higher value if 0.1 is less that older bootstrap estimates should also be tried. The current value of 0.01 appears quite small given what seems to be substantial uncertainty associated with the processes of allocating catch to "fishery" (strata) and species. Recommendation. If this fails then maybe refit the model multiple times to simulated data based on assumed higher level of error.
3. Check that the LFs tails are rolled up - if not then turn on and do model run (tail compression).
4. Selectivity simplifications (double-normal for purse seine and logistic for LL)
5. Redo the likelihood plots for the reference model given the vertical lines in different places.
6. Redo sensitivity analysis g: "No longline index of abundance. The longline index of abundance and its associated length composition data are excluded from the model. The selectivity of the longline fishery is fixed at that estimated by the reference case." In redo keep the length composition data and still estimate selectivity for this fishery but do not use the index of abundance.

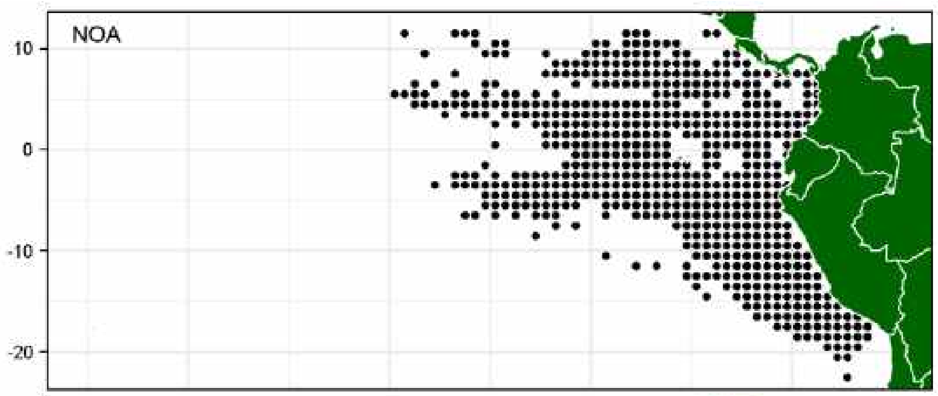
Data request 1. Provide estimates of the proportion of effort and catch included in the grids used in calculating CPUE indices for Purse Seine by year



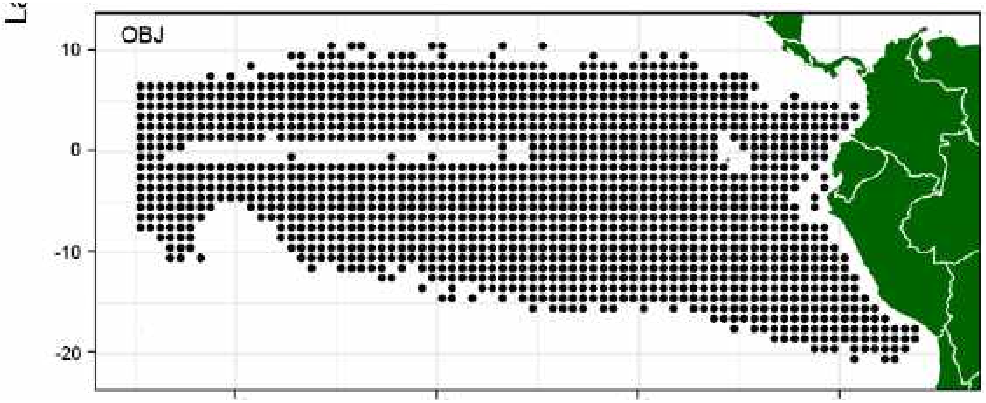
Data

We restrict the spatial domain of the catch and effort dataset to the "core" fishing ground for SKJ

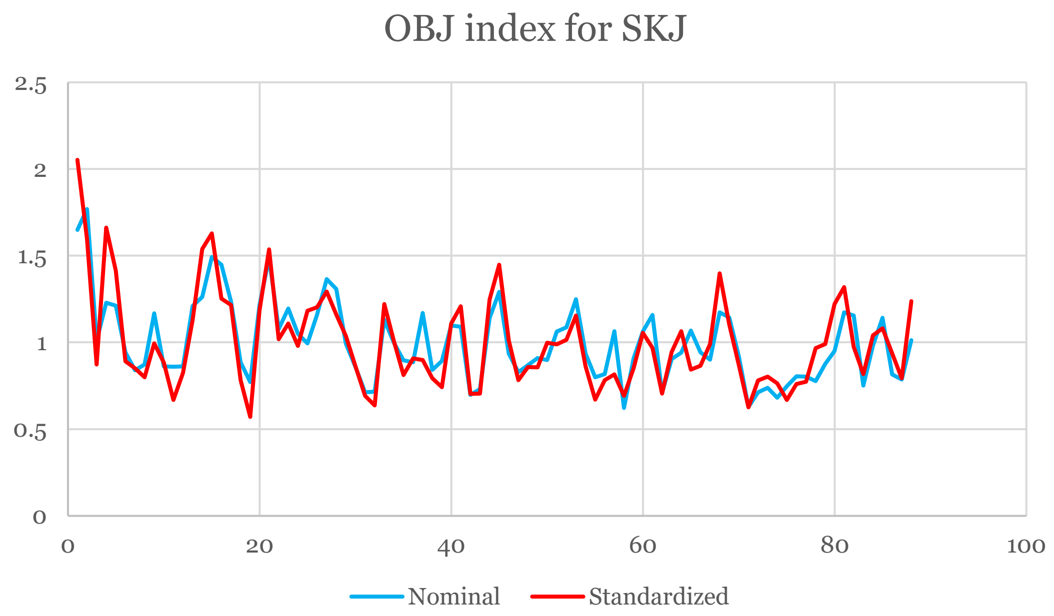
NOA: grids with >= 6 years of data between 2000-2021

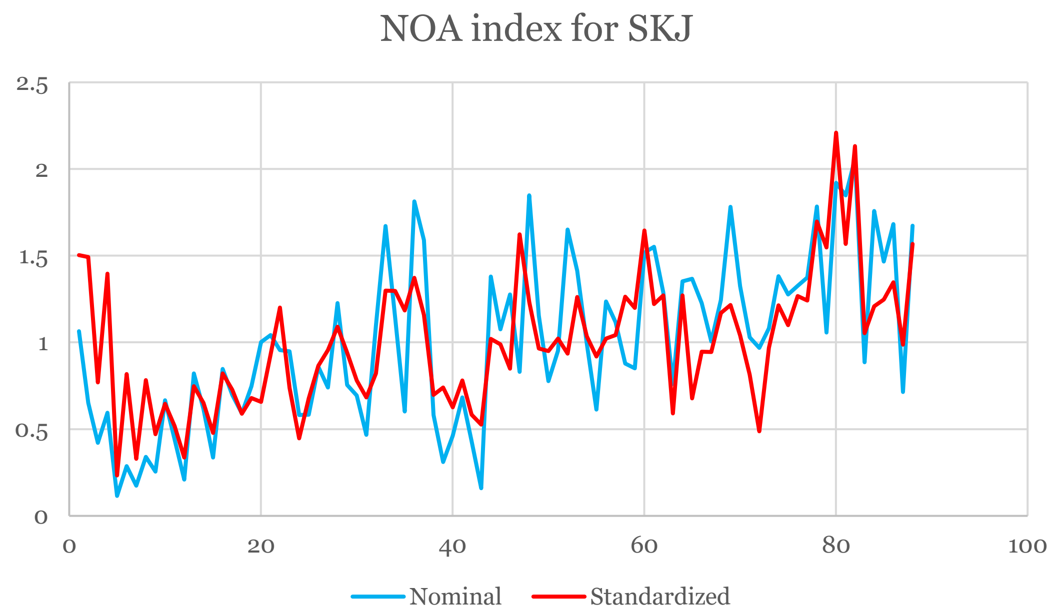


OBJ: grids with >= 11 years of data between 2000-2021



Data request 2. Provide alternative indices based on just raw catch/effort using all grids for purse seine.



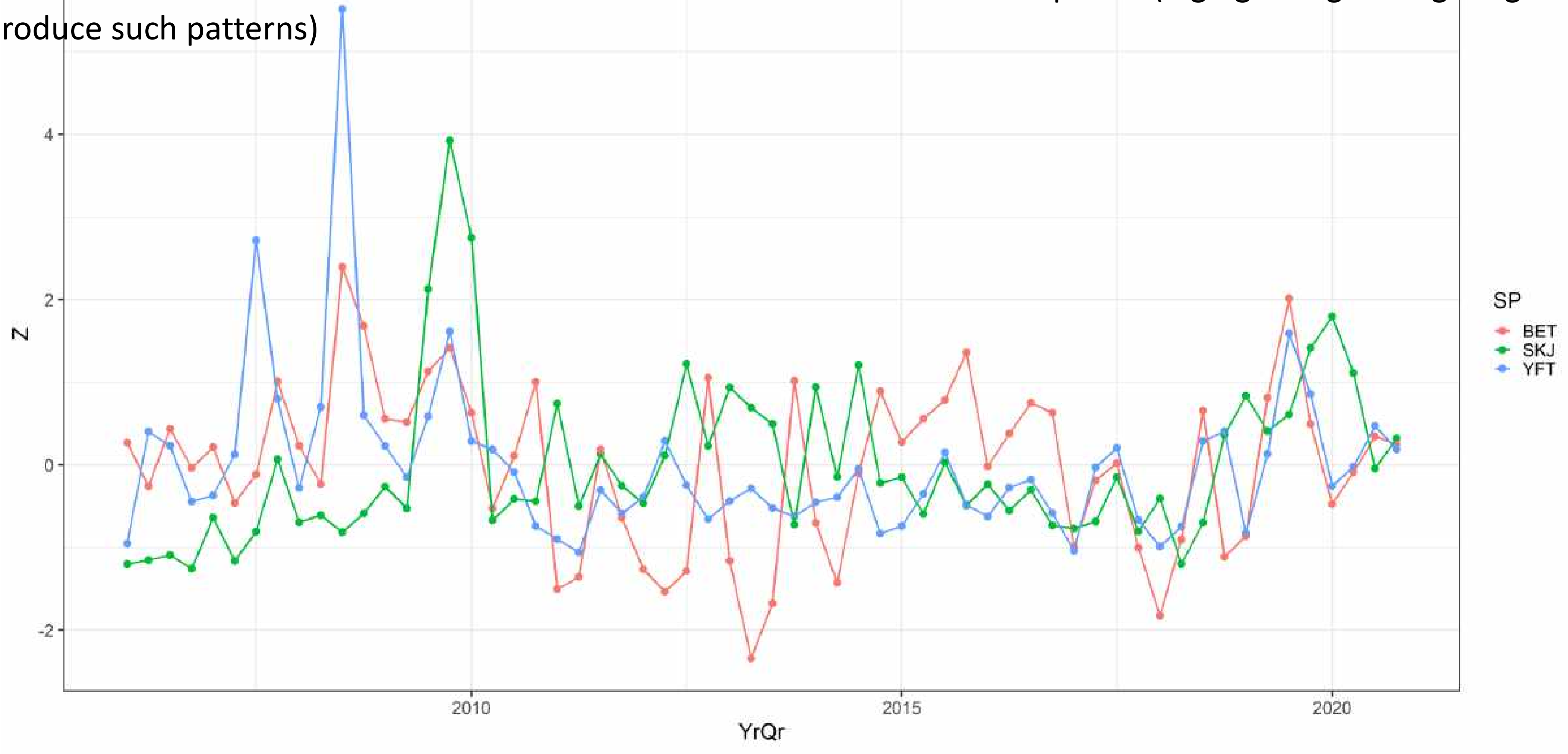


The difference could be due to:

- Whether data are filtered (core fishing ground only)
- Sample-weighted vs. area-weighted
- Whether to account for vessel effects on catchability
- etc.

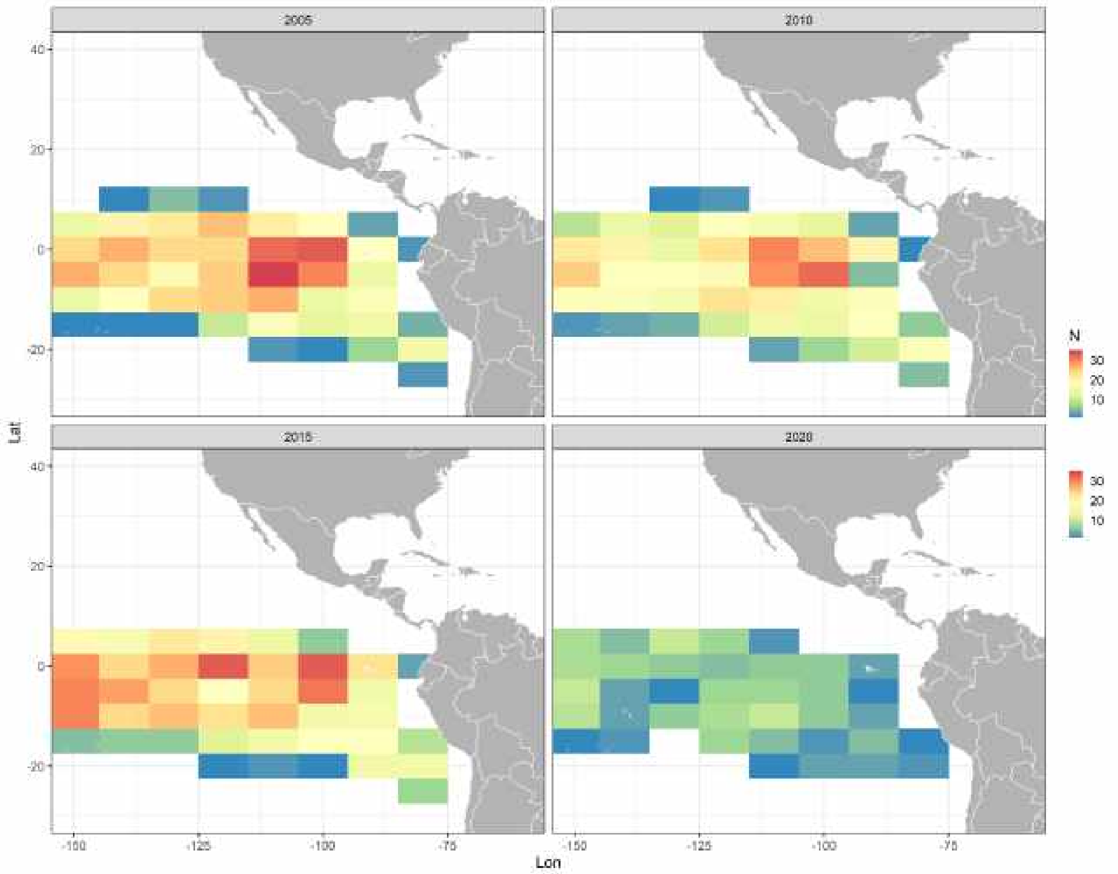
Request 3: . Plot the standardized (Z score) of the nominal CPUE for Bigeye, SKJ, YFT. From longline fishery from Japan.)

Rationale to check if the SKJ catch fluctuations too tied to fluctuations of other species (high grading or targeting might produce such patterns)

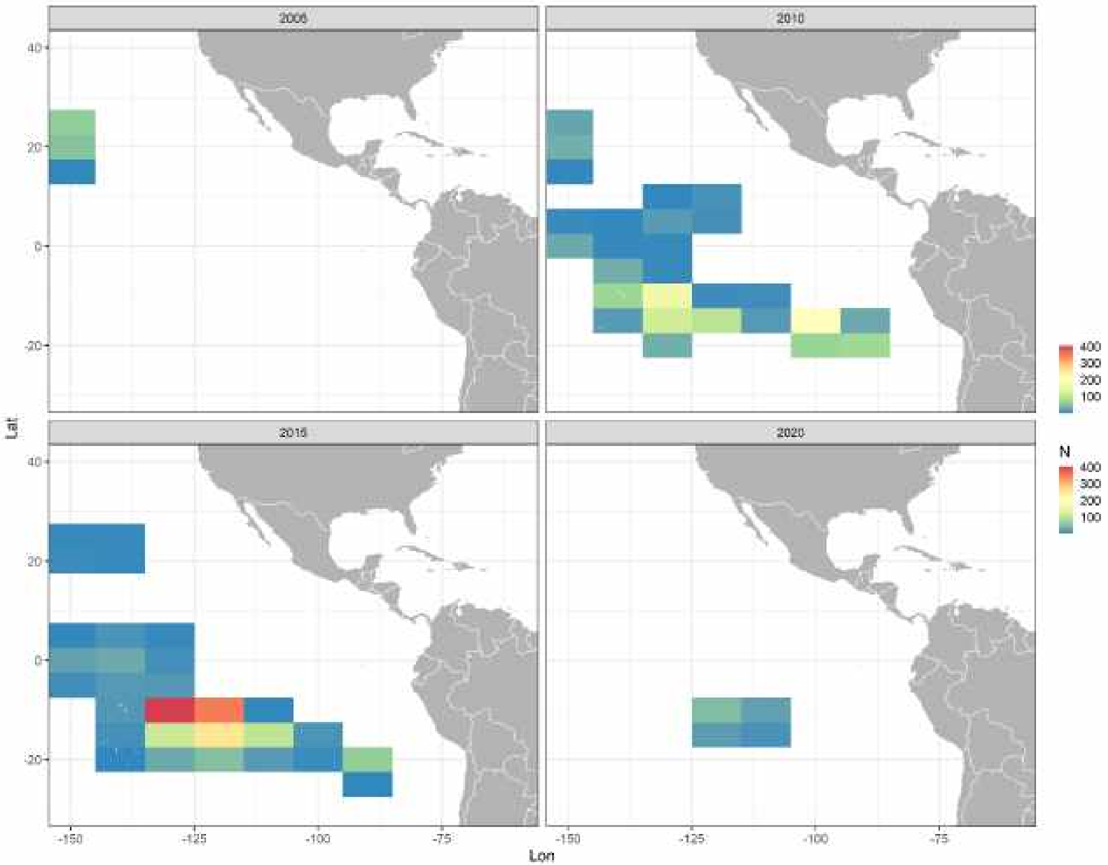


Request 4 . Look at overlap of PS with LL and compare length compositions in data restricted to be where the LL and PS are both operating to see if large fish seen in the longline still seen in places where PS operates.

PS- OBJ distribution of samples



LL distribution of samples



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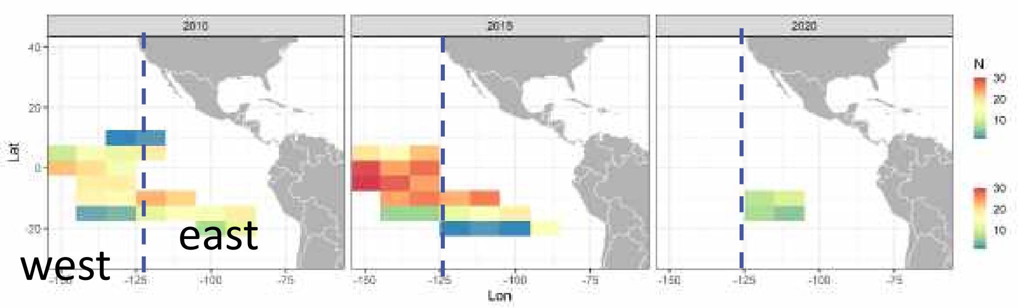
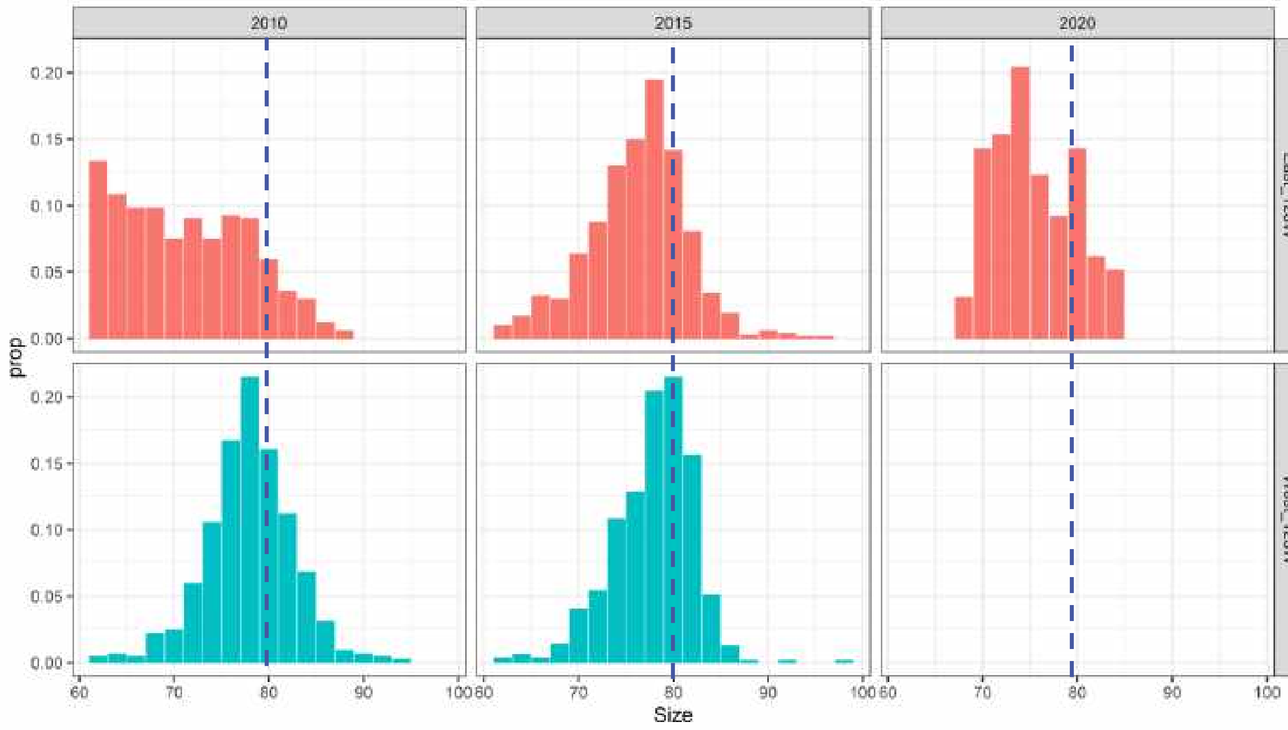
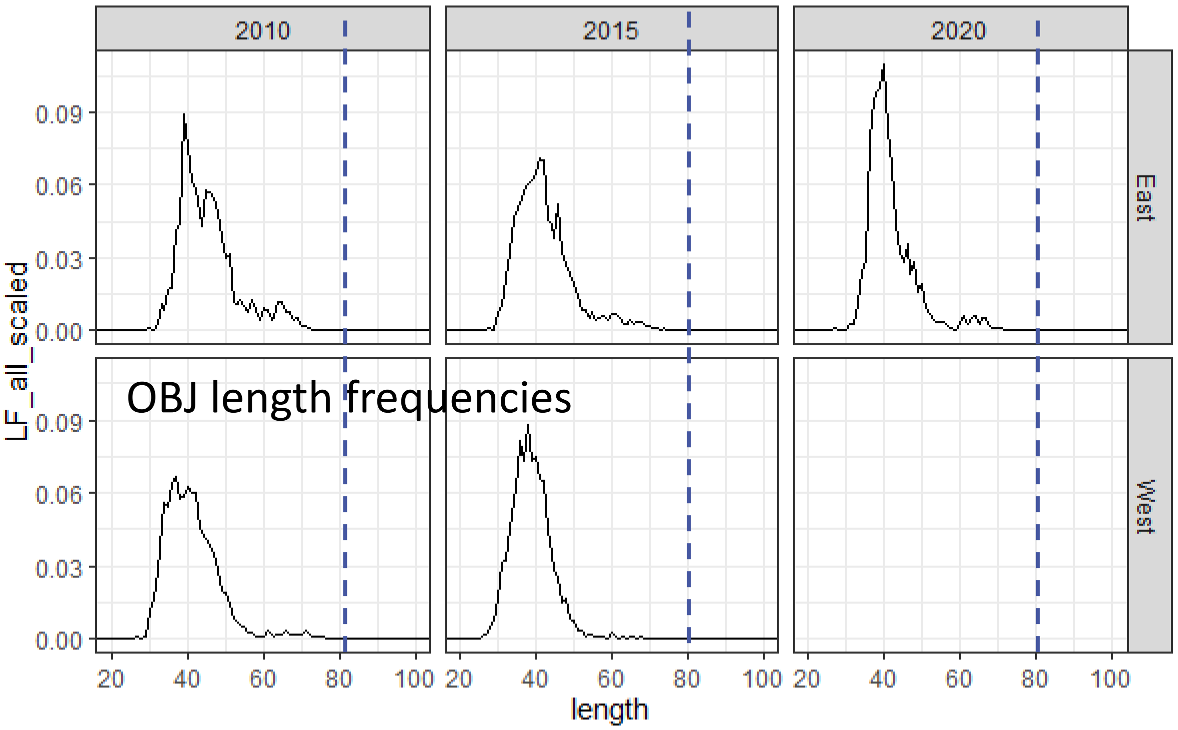
Overlap



LL length frequencies





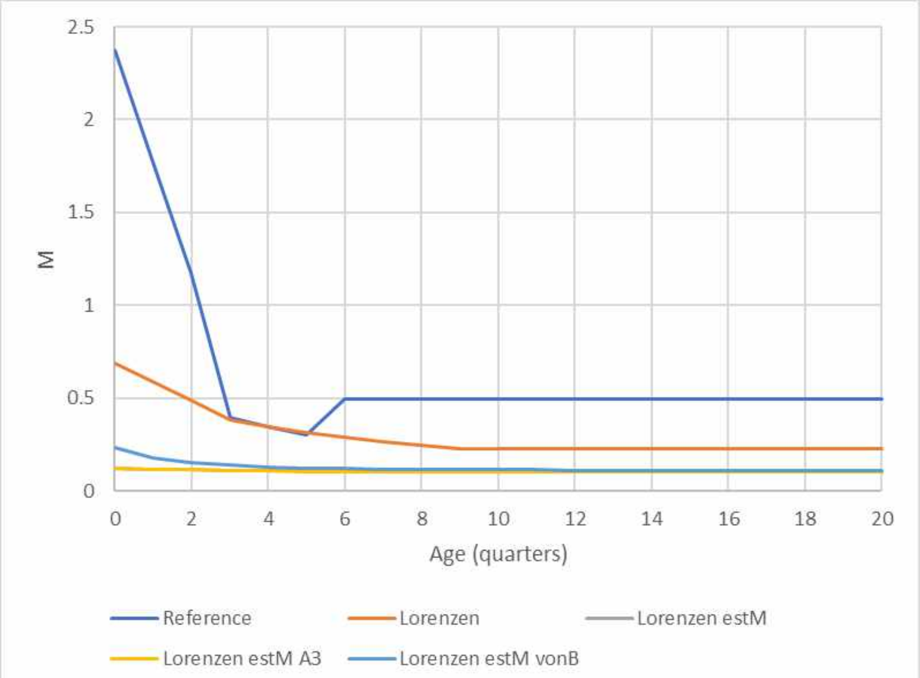
Request 4.1

- Calculate residuals for age comps adjusted to deal with negative correlation among ages for MN.

Model request 1. Refit the assessment models with the Lorenzen mortality with the scale estimated

1a. Refit the assessment models with the Lorenzen mortality with the scale estimated. Rationale: M might be different than assumed.
1b. Change the assumed growth model so age at 37cm to be 3 quarters. Still estimate M as in 3a..
1c. Change to the vonB with Linf and L at young age fixed and K estimated and estimate M as in 3a.

79.52	34.79	12.4	0	2002.41
2627.61	2582.88	2560.49	2548.09	4550.5
Reference	Lorenzen	Lorenzen estM	Lorenzen estM A3	Lorenzen estM vonB



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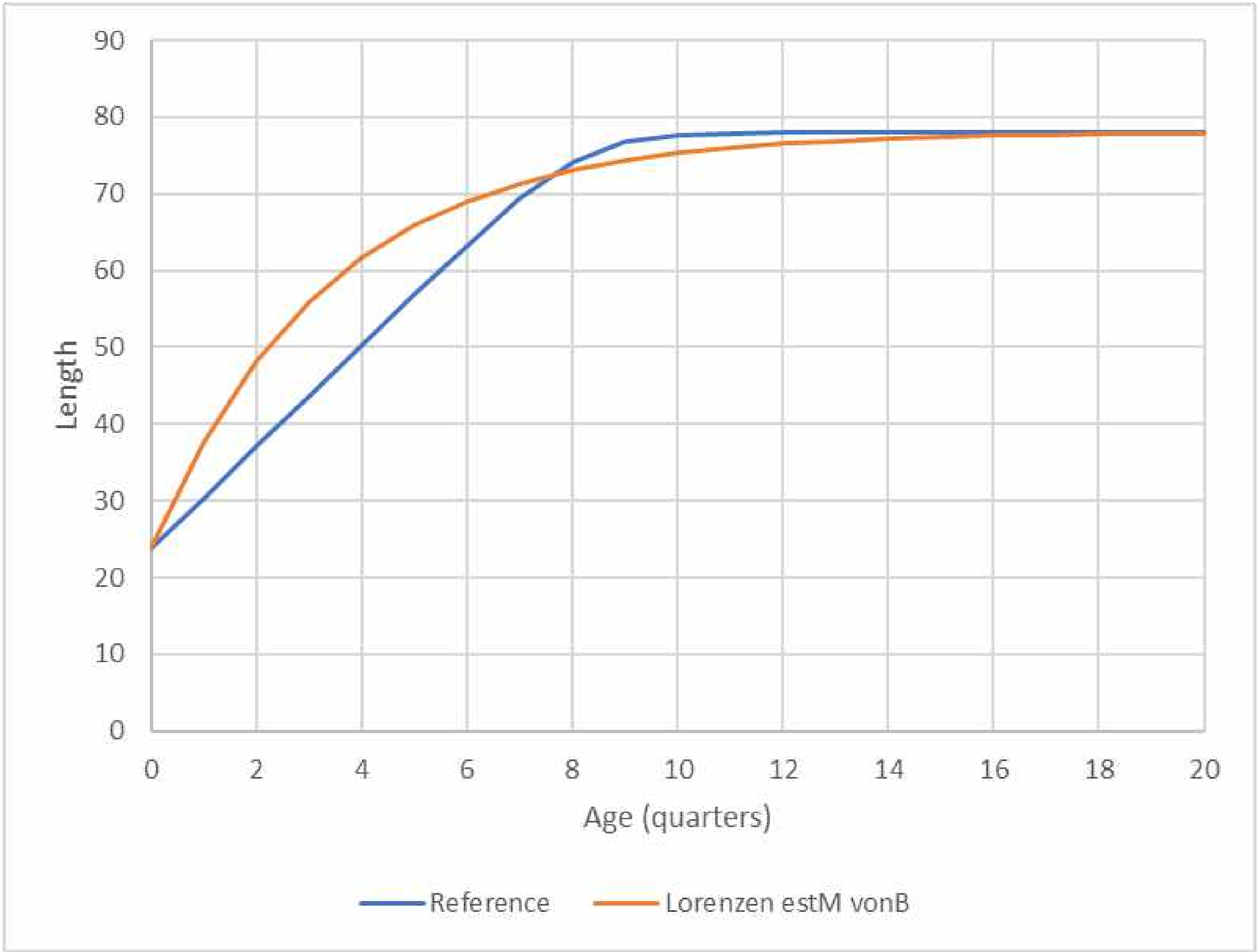

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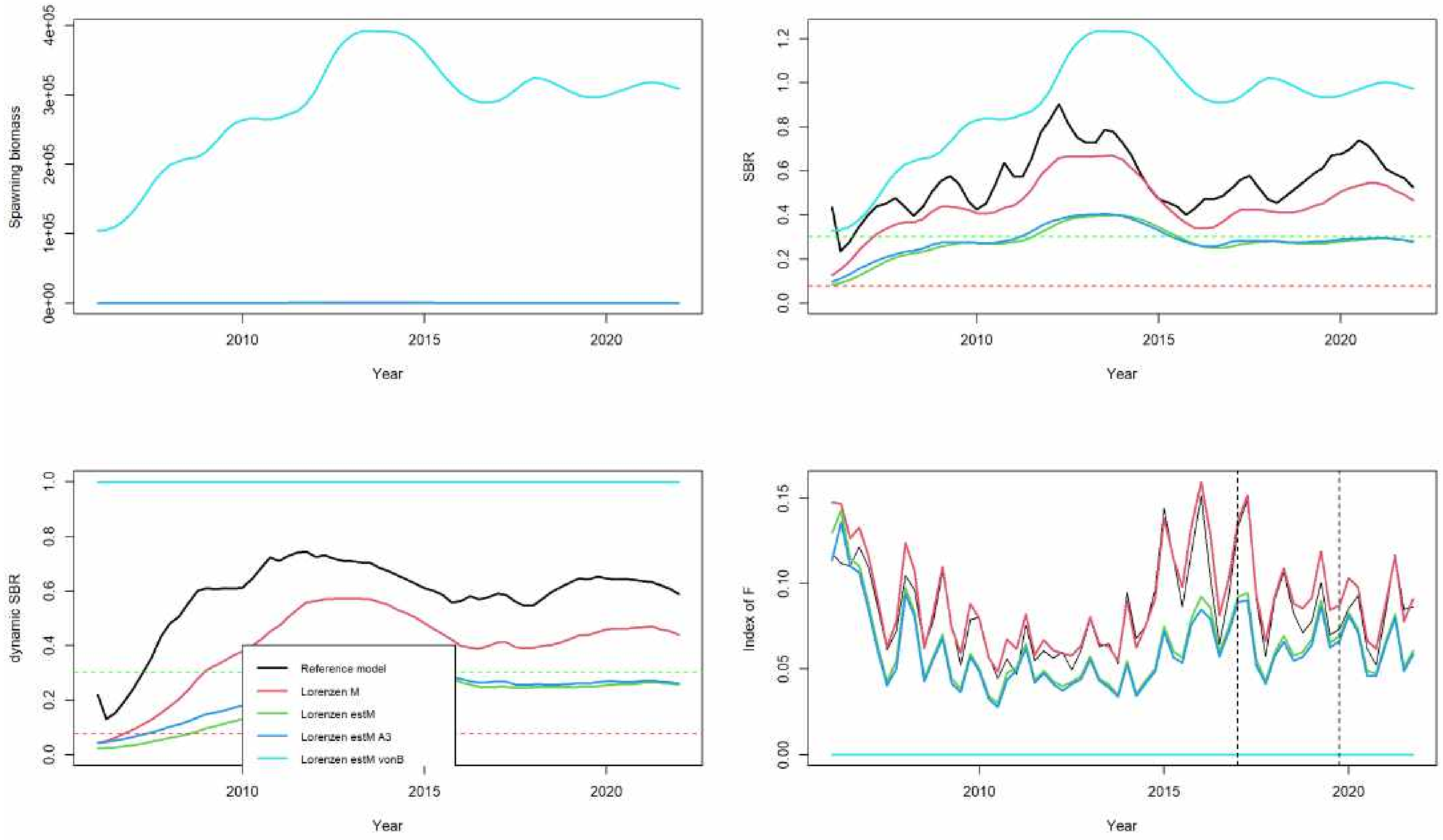

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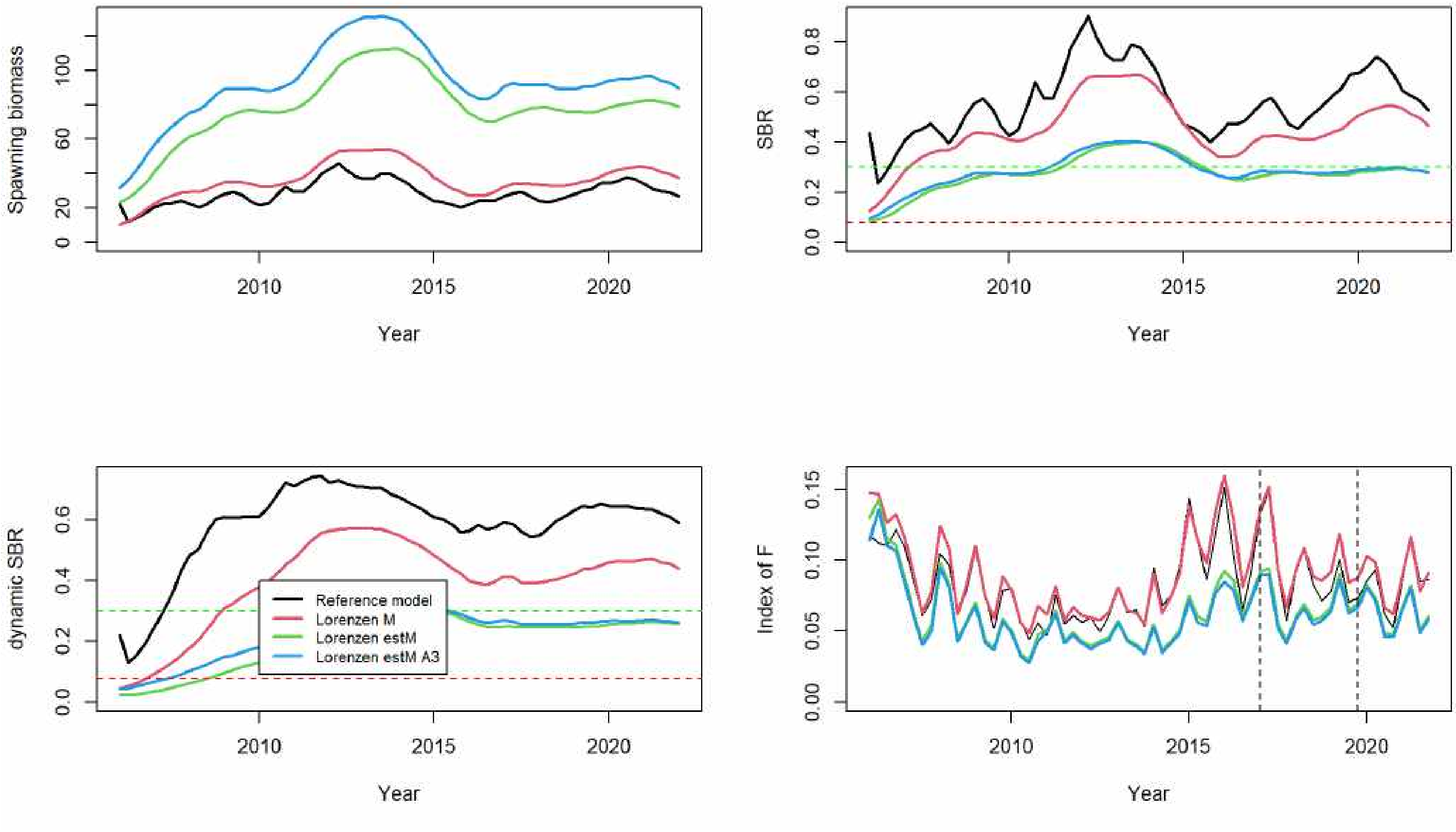
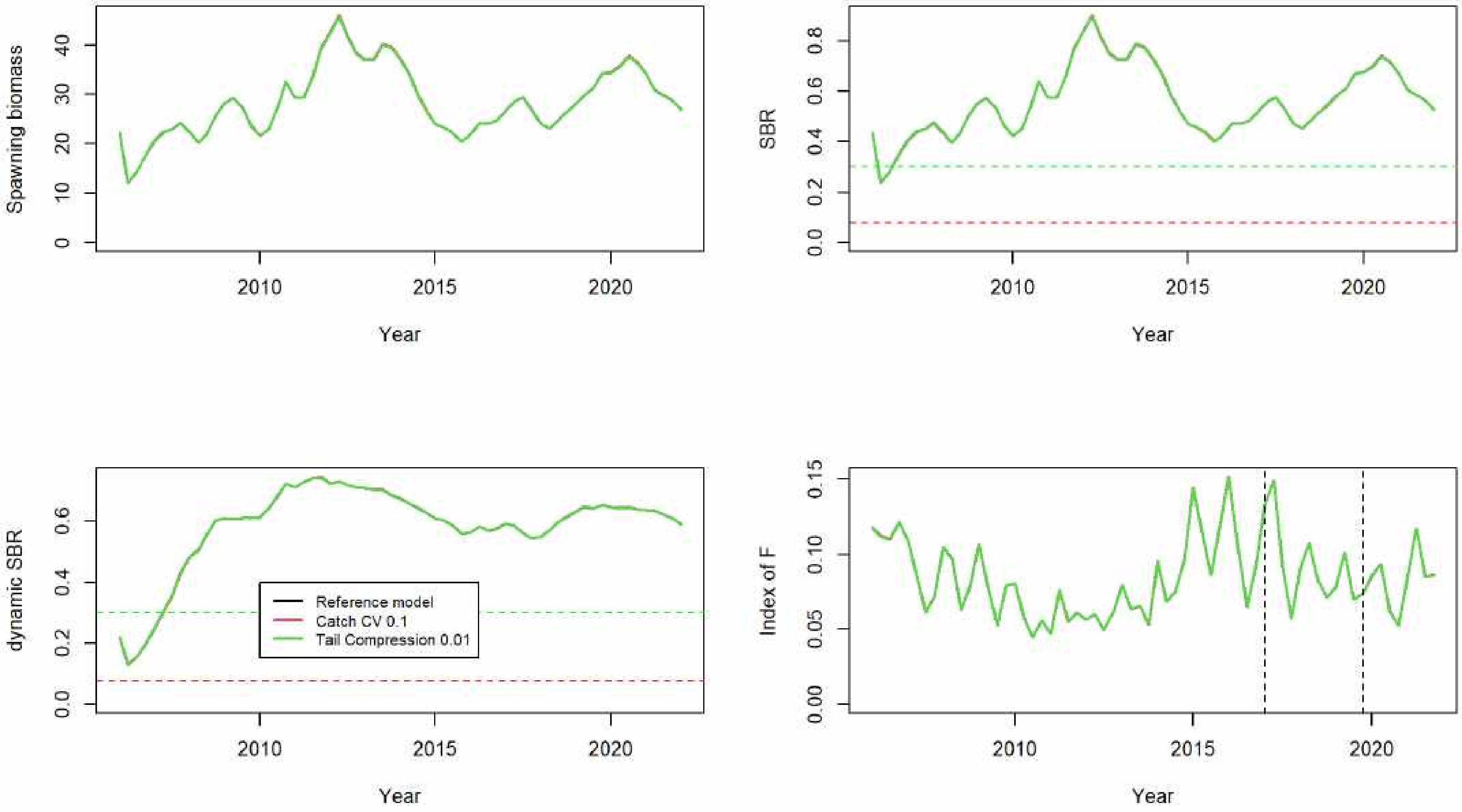


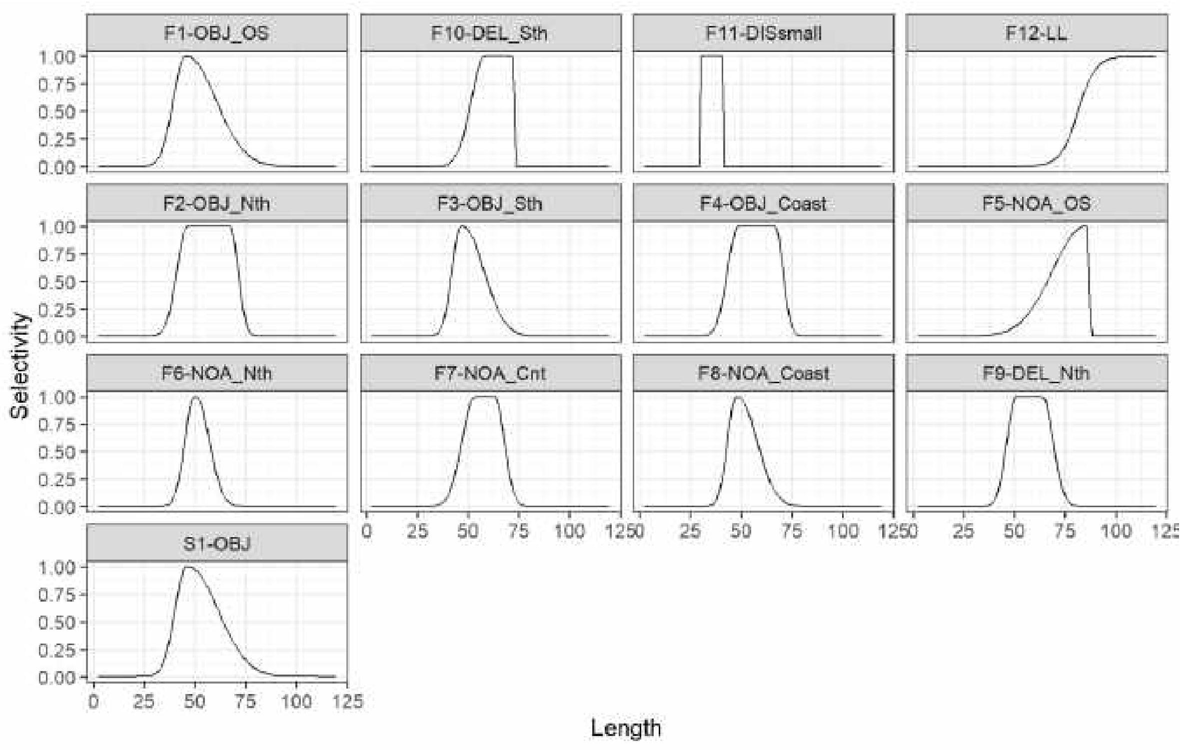
Model request 2. Fit the assessment model with a higher SE for log-scale catch

Model request 3. Check that the LFs tails are rolled up - if not then turn on and do model run (tail compression)

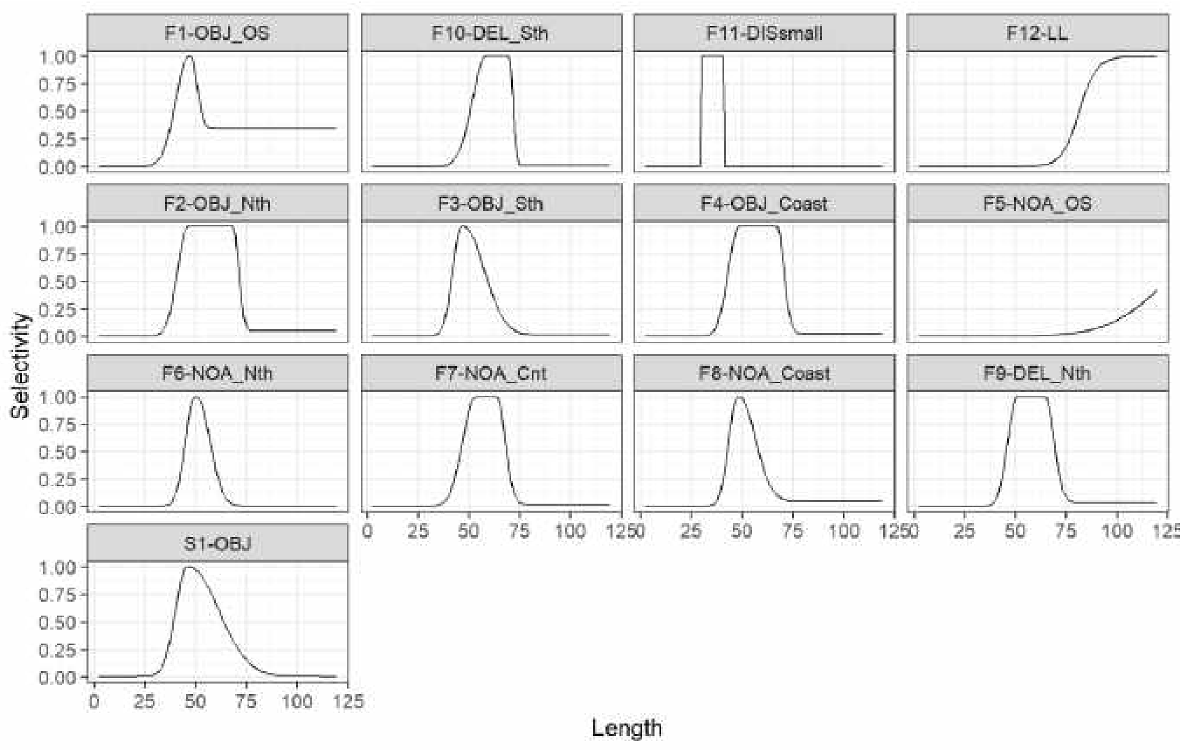


Model request 4. Selectivity simplifications (double-normal for purse seine and logistic for LL)

Double normal zero max



Double normal no zero max



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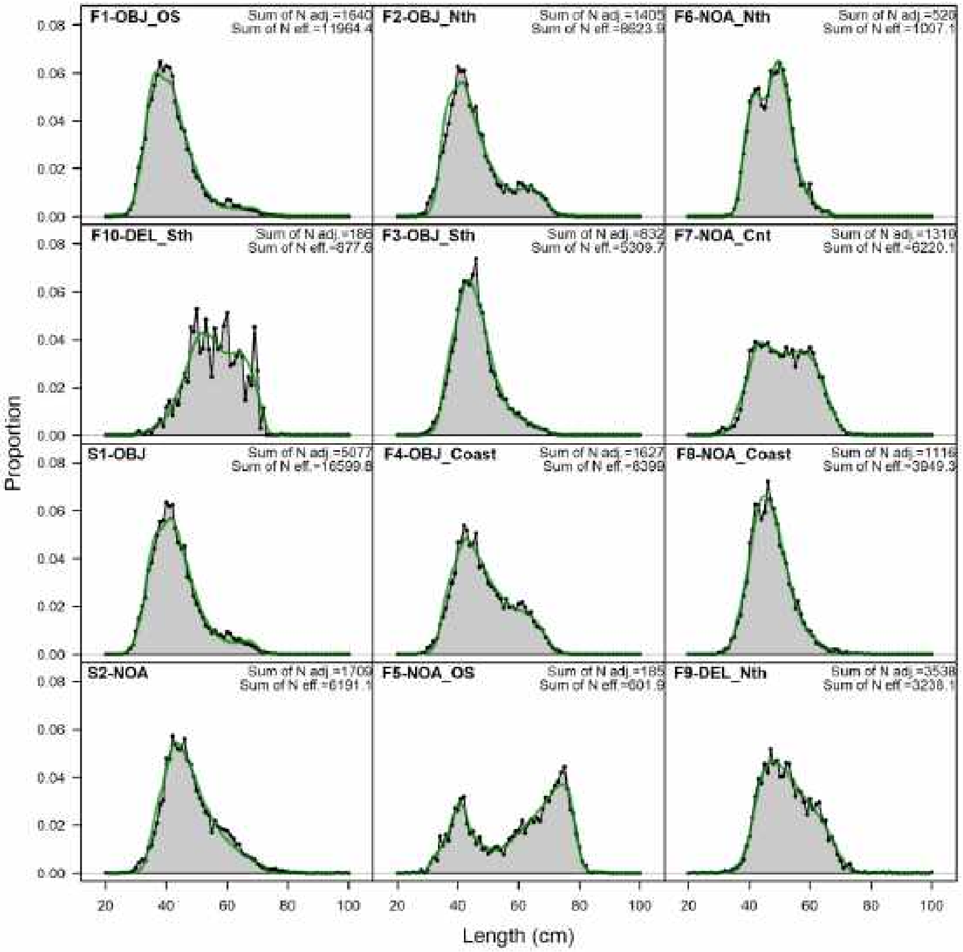
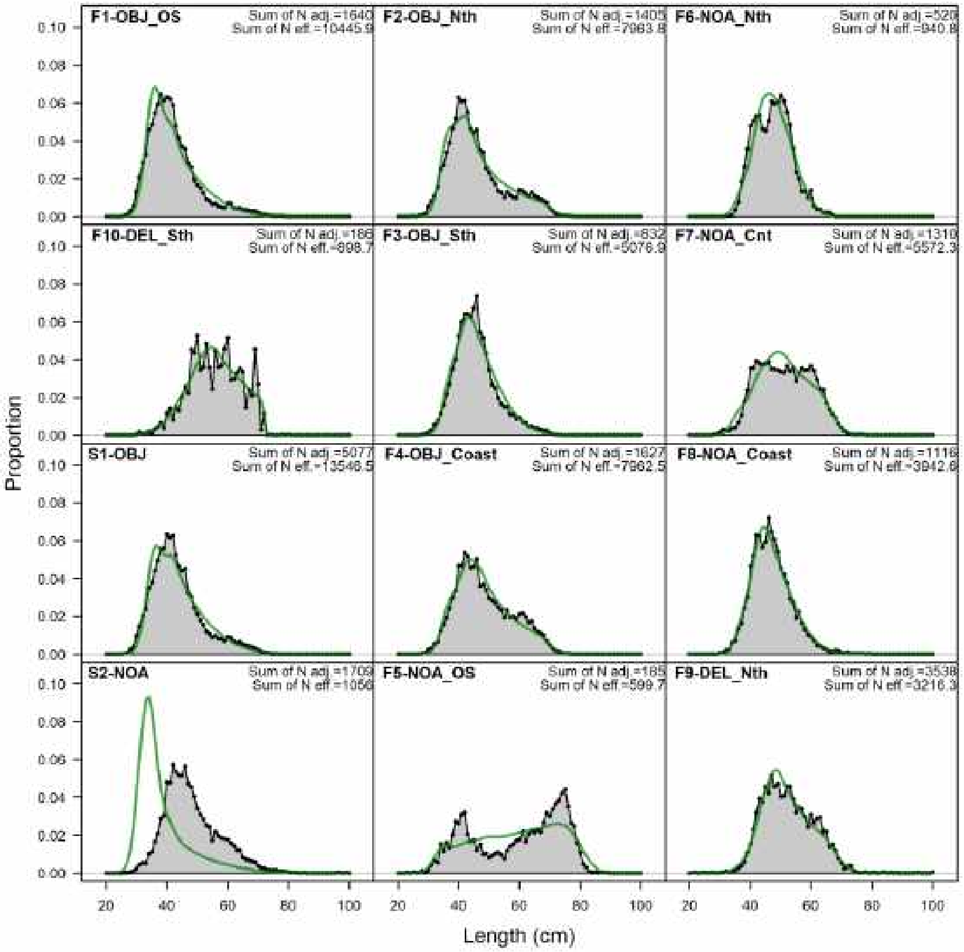
Reference 2627.61



Simple selectivities 2800.99



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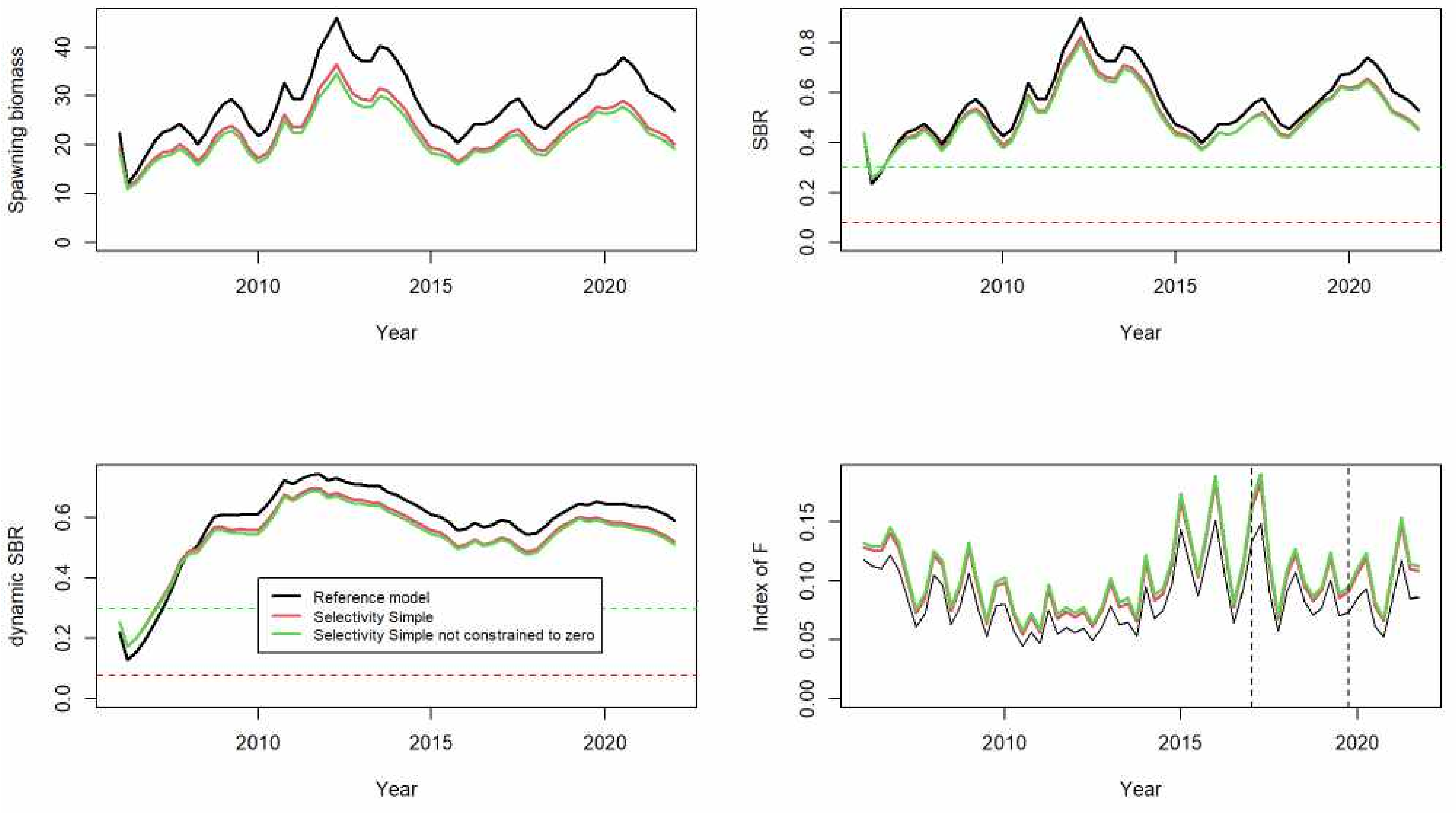

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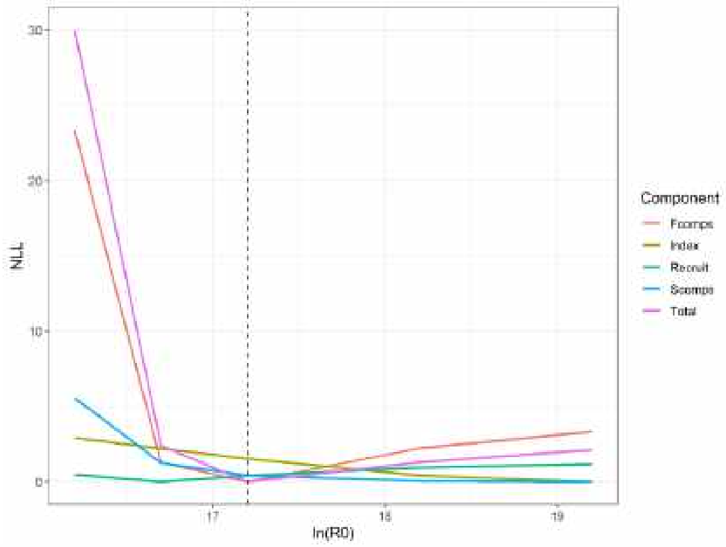
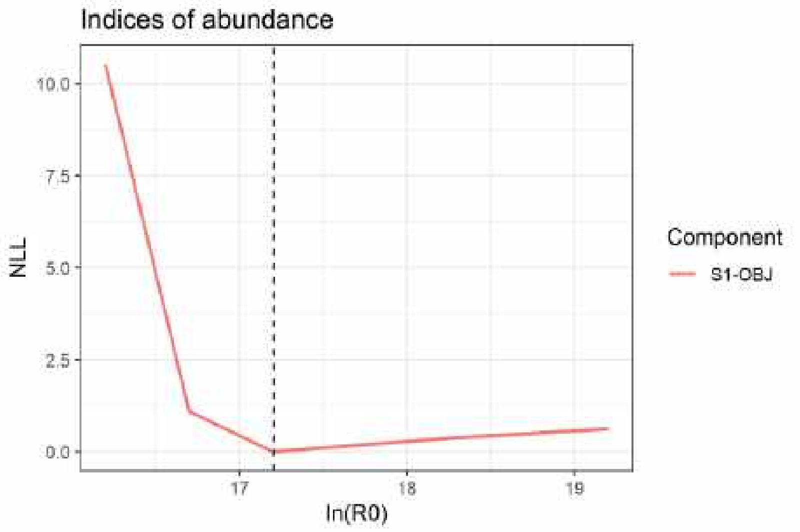
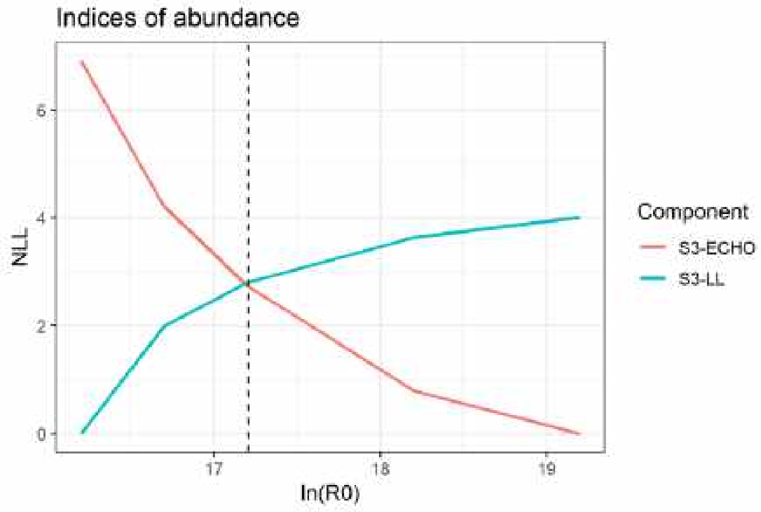
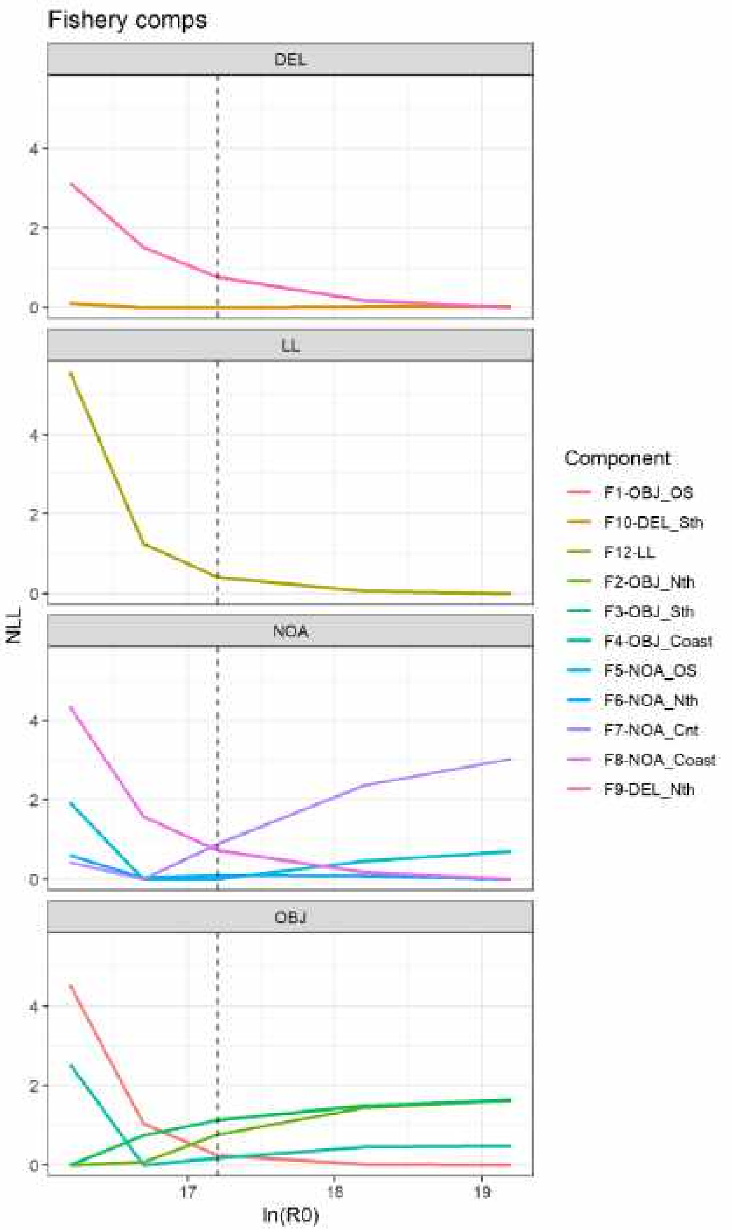
Model request 5. Redo the likelihood plots for the reference model given the vertical lines in different places

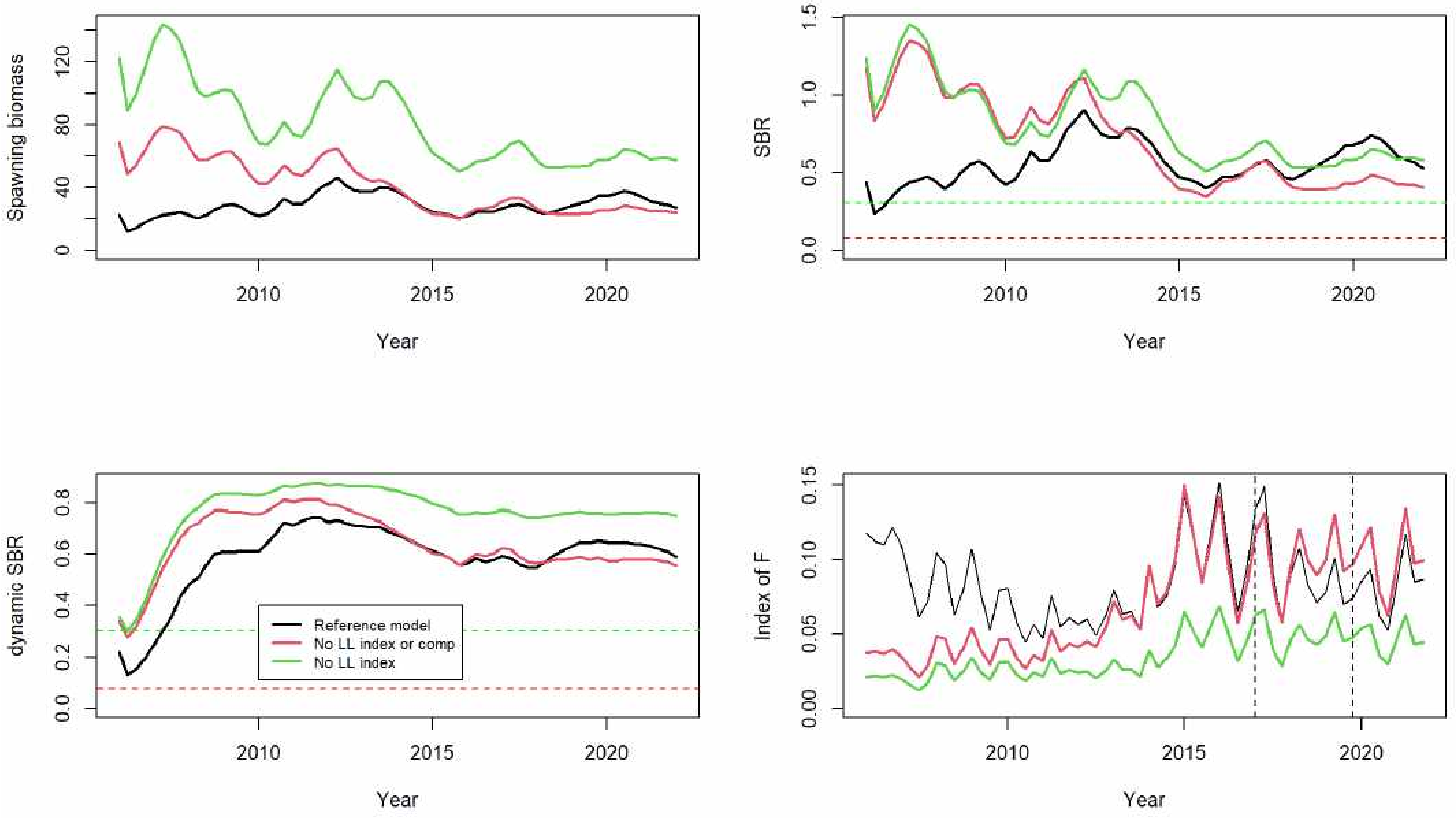








Model request 6. Redo sensitivity analysis g: No longline index of abundance. but keep the length composition data and still estimate selectivity

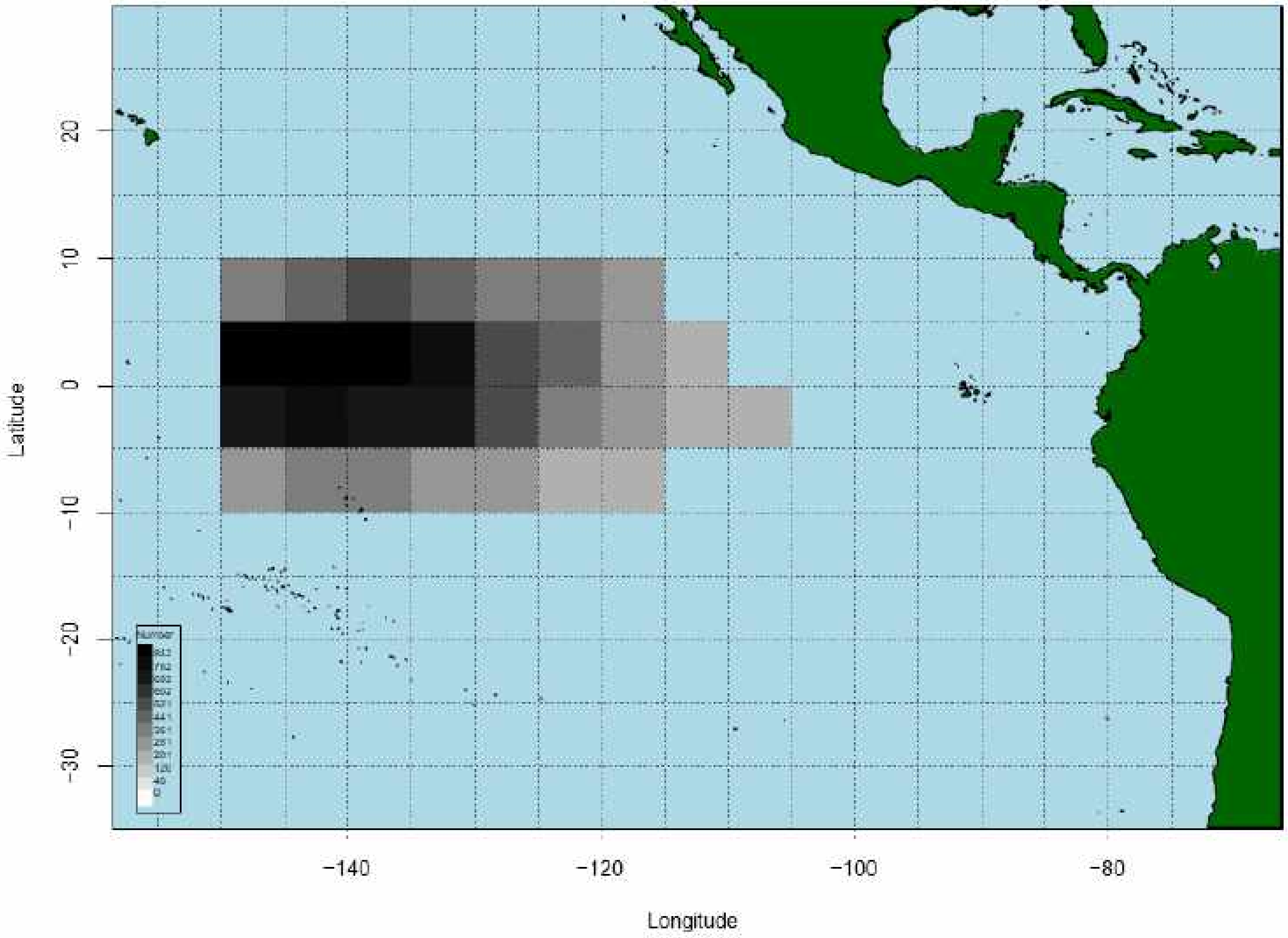


Day 3 requests

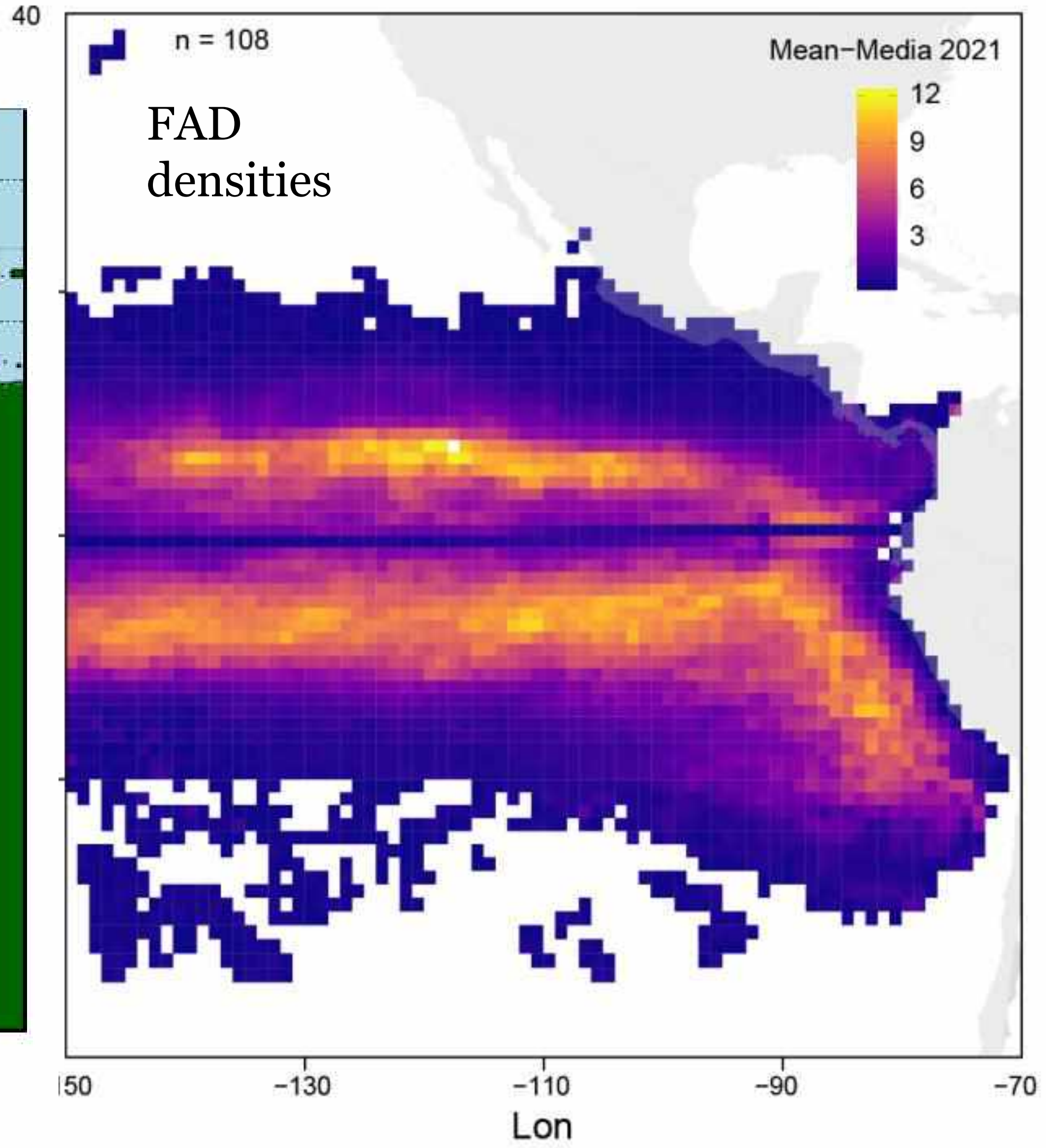
1. Maps of the echo sounders used to create the index, overall, and by year or year blocks.
2. Longline species composition over time, and also Longline catch Z scores over time for all three species. Motivation: Concern about the robustness of the trend in longline abundance index and hence overall biomass estimation.
3. For longline length comp data evaluate whether there is an effect of the data origin (by flag, or measured in Japanese training vessel, by observer or by crew) on the length frequency of skipjack, e.g., by comparing length comps of data subsets.
4. Investigate whether the Japanese data was collected in length or was transformed from weight
5. Not really a run request or specific data analysis but: Are there any data on variables that could influence catchability of long line, such as hook size or hook depth? What can be said in general about potential for changes in catchability/fishing power for the longline fishery? We envision having a discussion on this rather than just looking at results of specific analysis.
6. Calculate cpue for longline data by east/west of 120. We realize this will be sparse and perhaps with no observations for one of the regions in some years, but looking to see if overall trend is potentially influenced by location.
7. Kobe plot for the panel requested runs with runs distinguished so we can identify which runs are which. We are fine with using the same reference points for standardization as were used in the plot in the assessment report.
8. Run: Analysis with alternative M from Peatman et al. 2022 (pttp early mixing of 2).
9. Run: Francis reweighting of likelihood or if not feasible lower level of Neff.
10. Run: Check if sigma R given as input is consistent with the the temporal variation in the recruitment estimates. If not adjust the sigma R and do run with new value of sigma R.

Request 1. Buoy distribution of the index vs overall buoy distribution

Number of observations used in the index

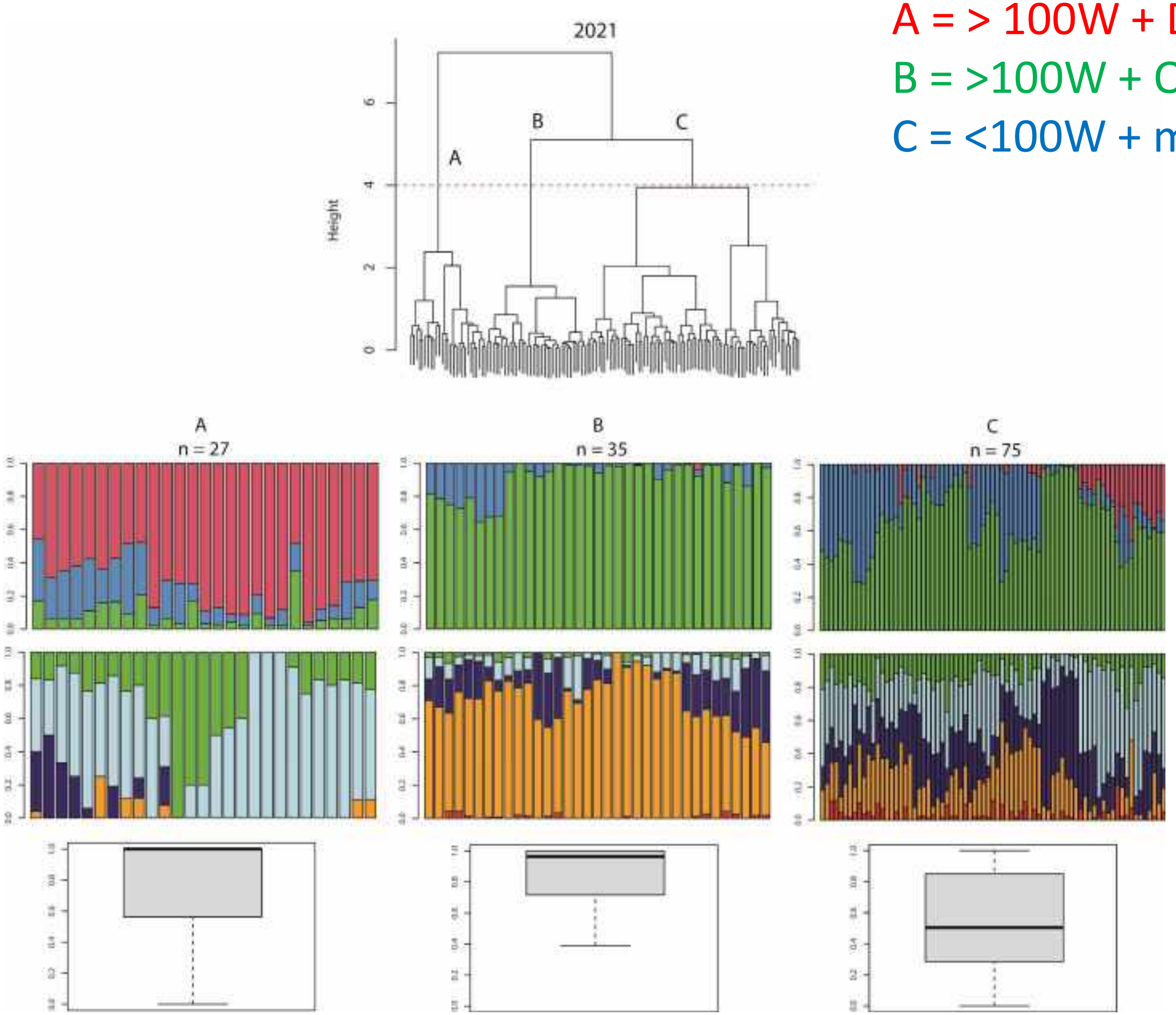


FAD densities



Request 1. Buoy distribution of the index vs overall buoy distribution

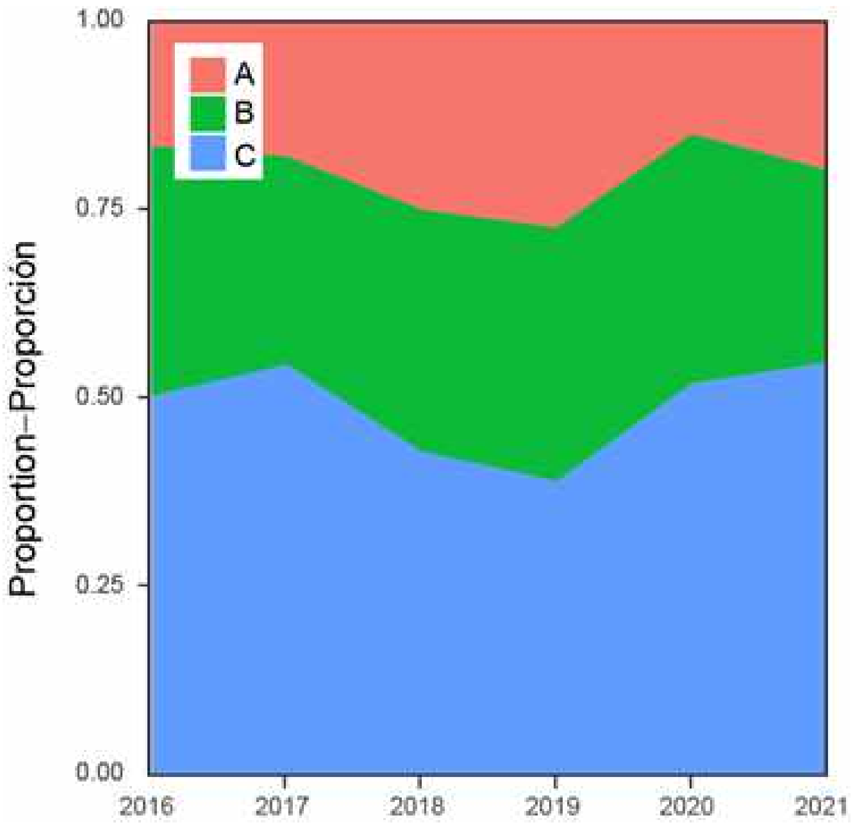
Fleet segments – Segmentos de la flota



A = > 100W + DEL and opportunistic OBJ sets

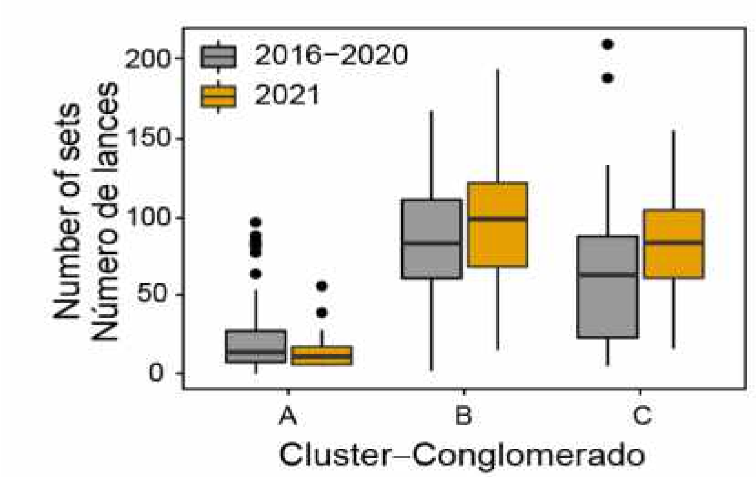
B = >100W + OBJ sets (monitored)

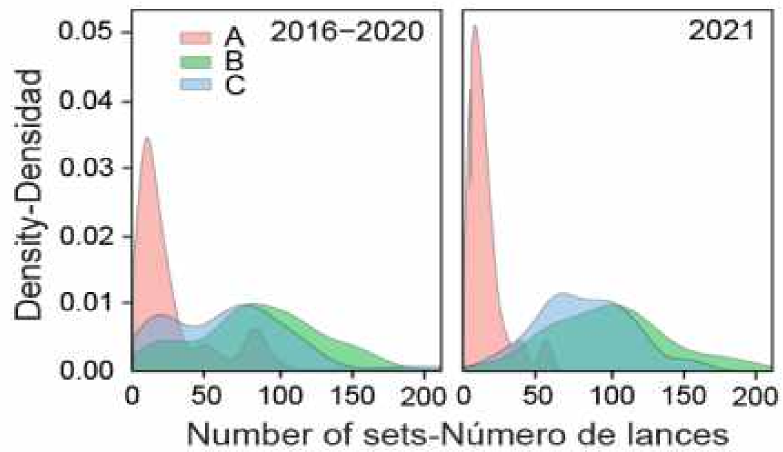
C = <100W + mix of set types

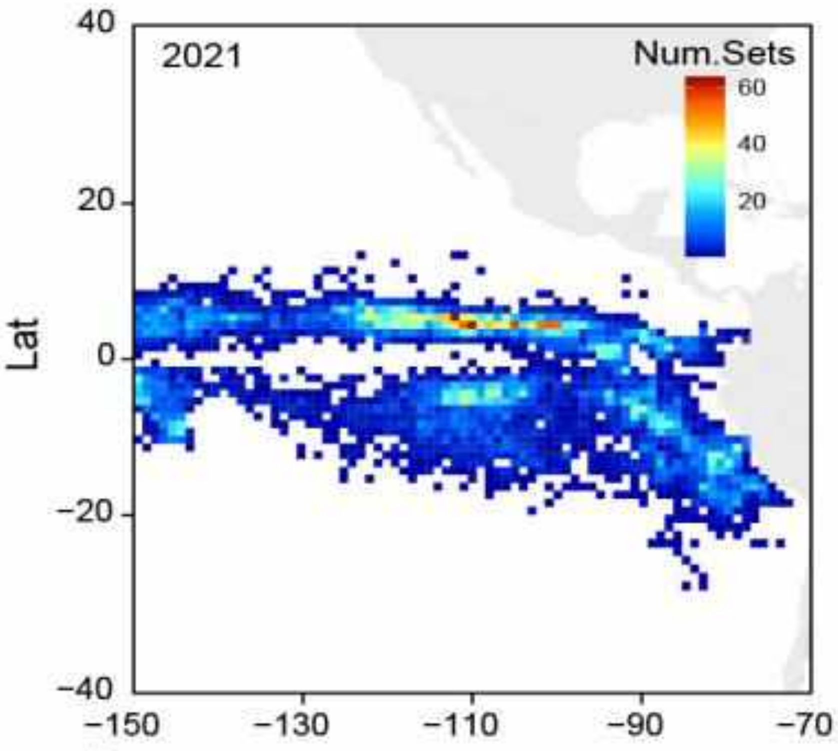


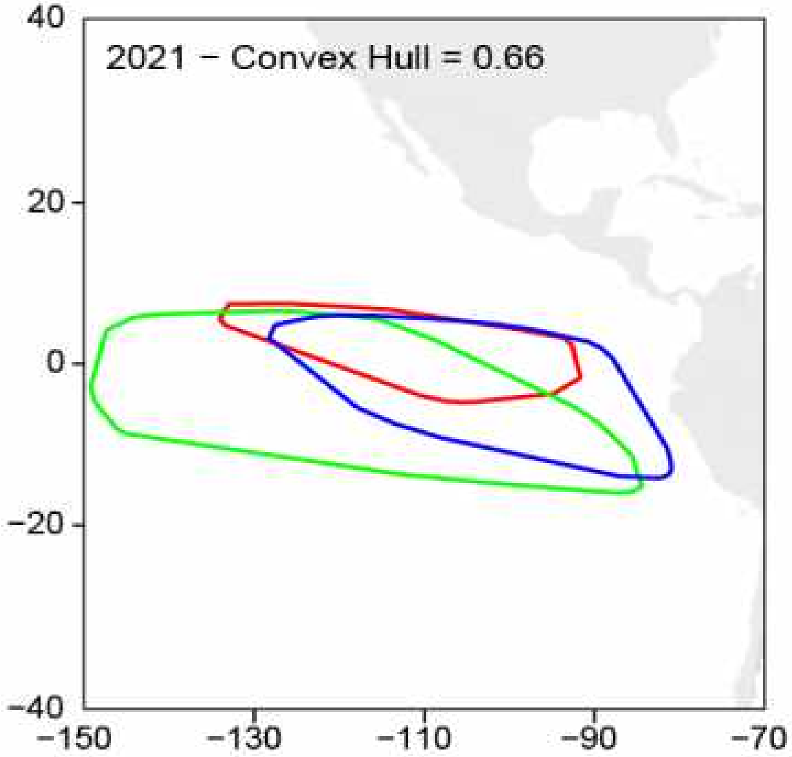
Request 1. Buoy distribution of the index vs overall buoy distribution

OBJ sets – Lances sobre OBJ





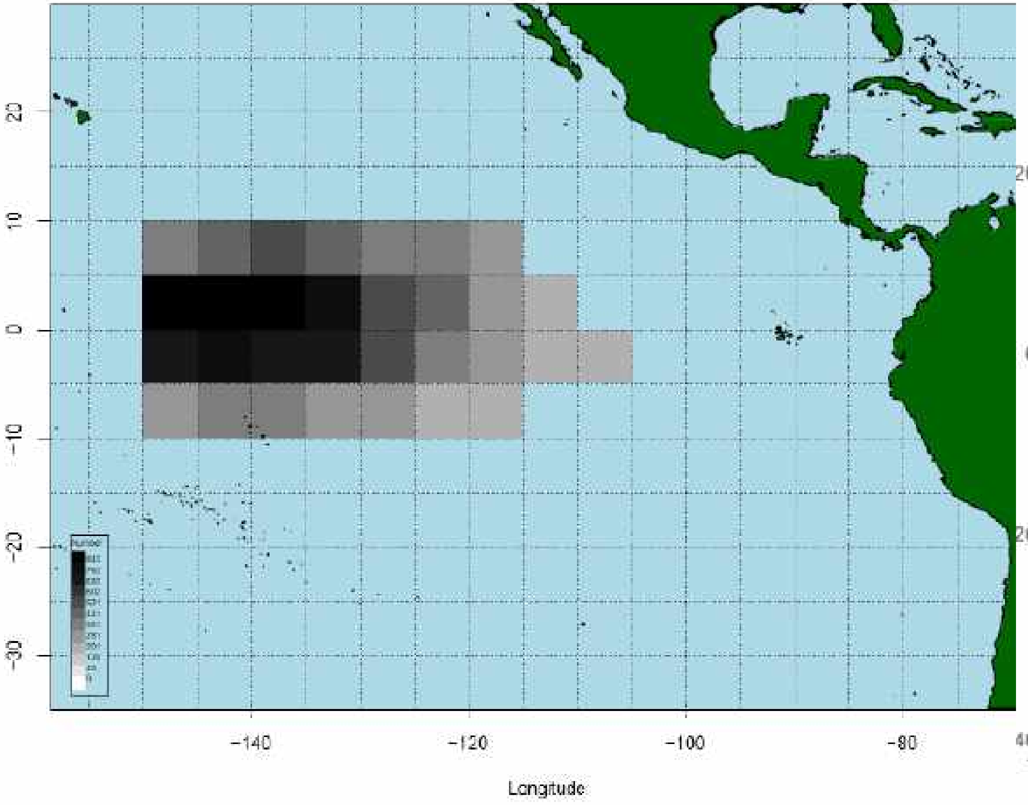




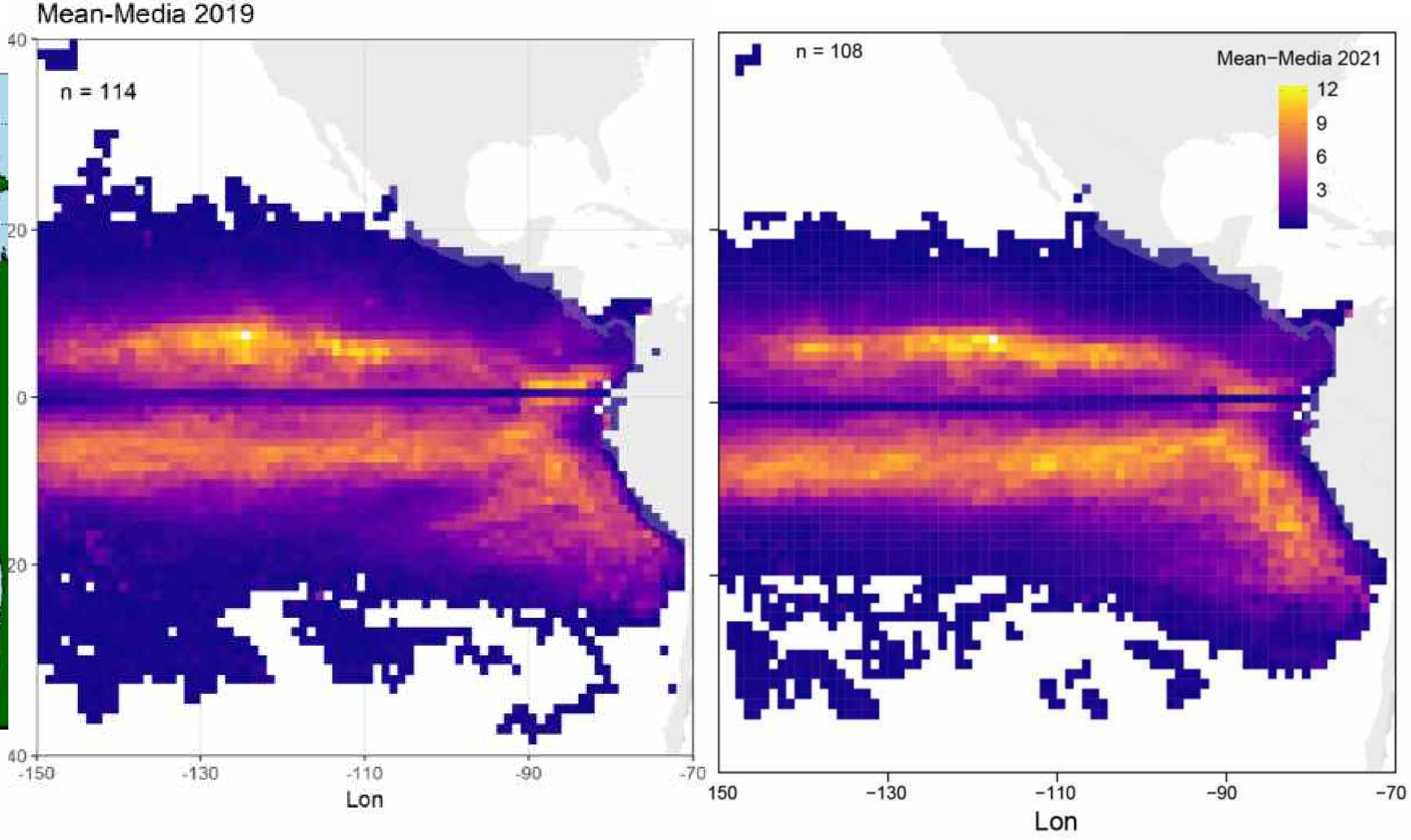
Year	Cluster	Deployments		Encounters		Sets	
		Vessel	Trip	Vessel	Trip	Vessel	Trip
2016-2020	A	4.6	1.5	45.1	14.3	24.8	7.8
	B	327.6	75.0	540.6	123.8	100.2	22.9
	C	84.0	16.1	243.2	46.6	71.4	13.7
2021	A	8.3	2.2	35.6	9.6	15.3	4.1
	B	526.8	104.8	751.7	149.5	101.2	20.1
	C	107.3	21.9	285.9	58.4	81.3	16.6

Request 1. Buoy distribution of the index vs overall buoy distribution

Number of observations used in the index



FAD densities



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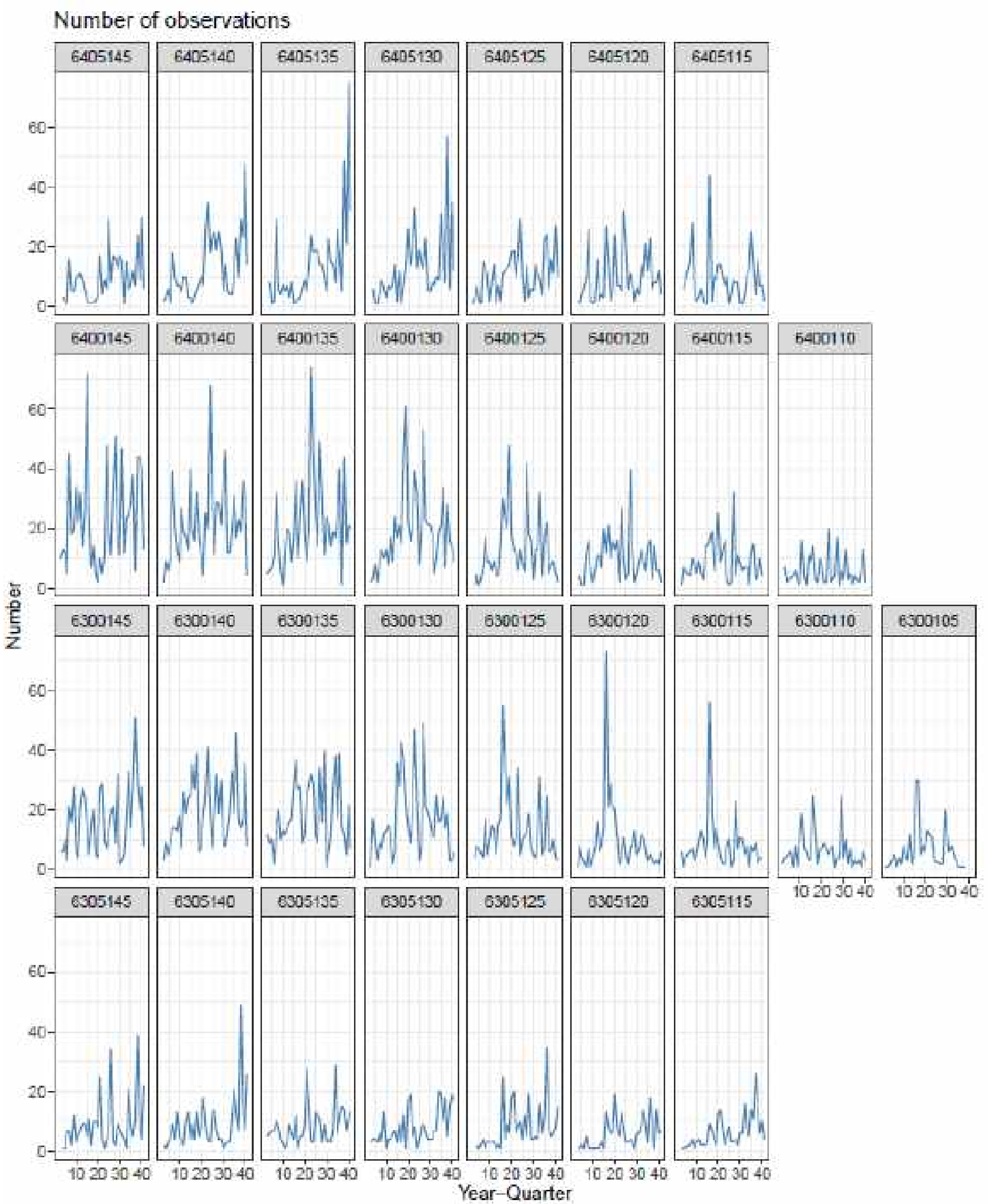
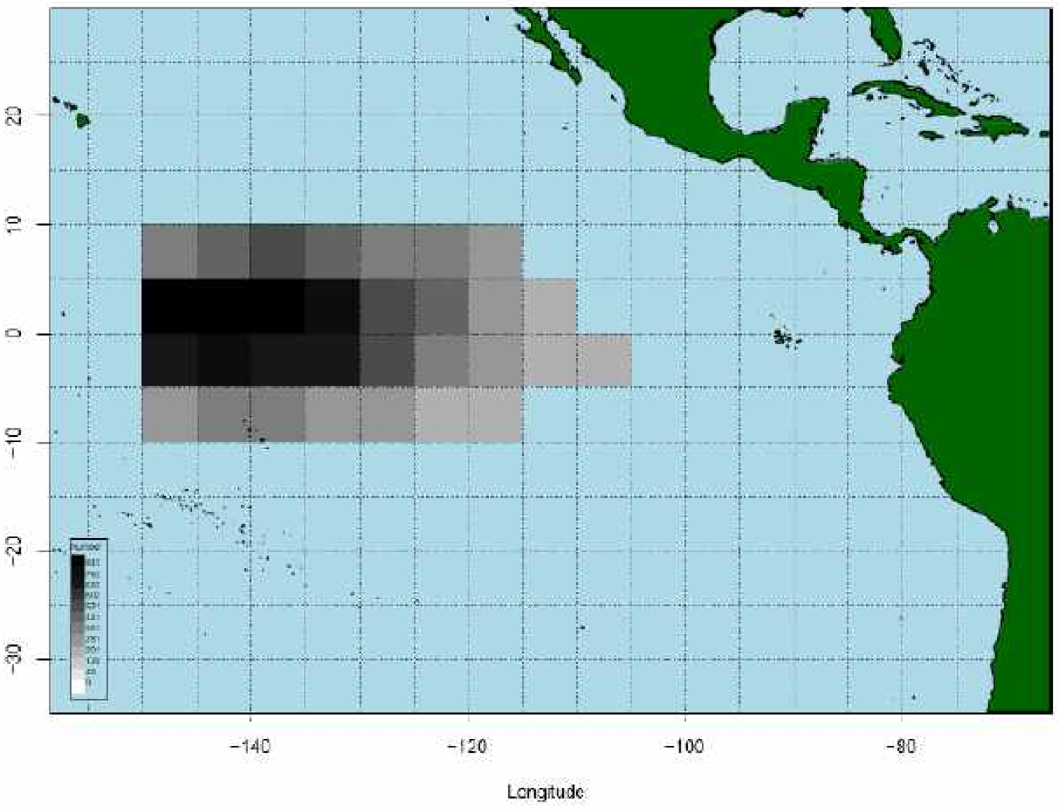


Number of observations
used in the index



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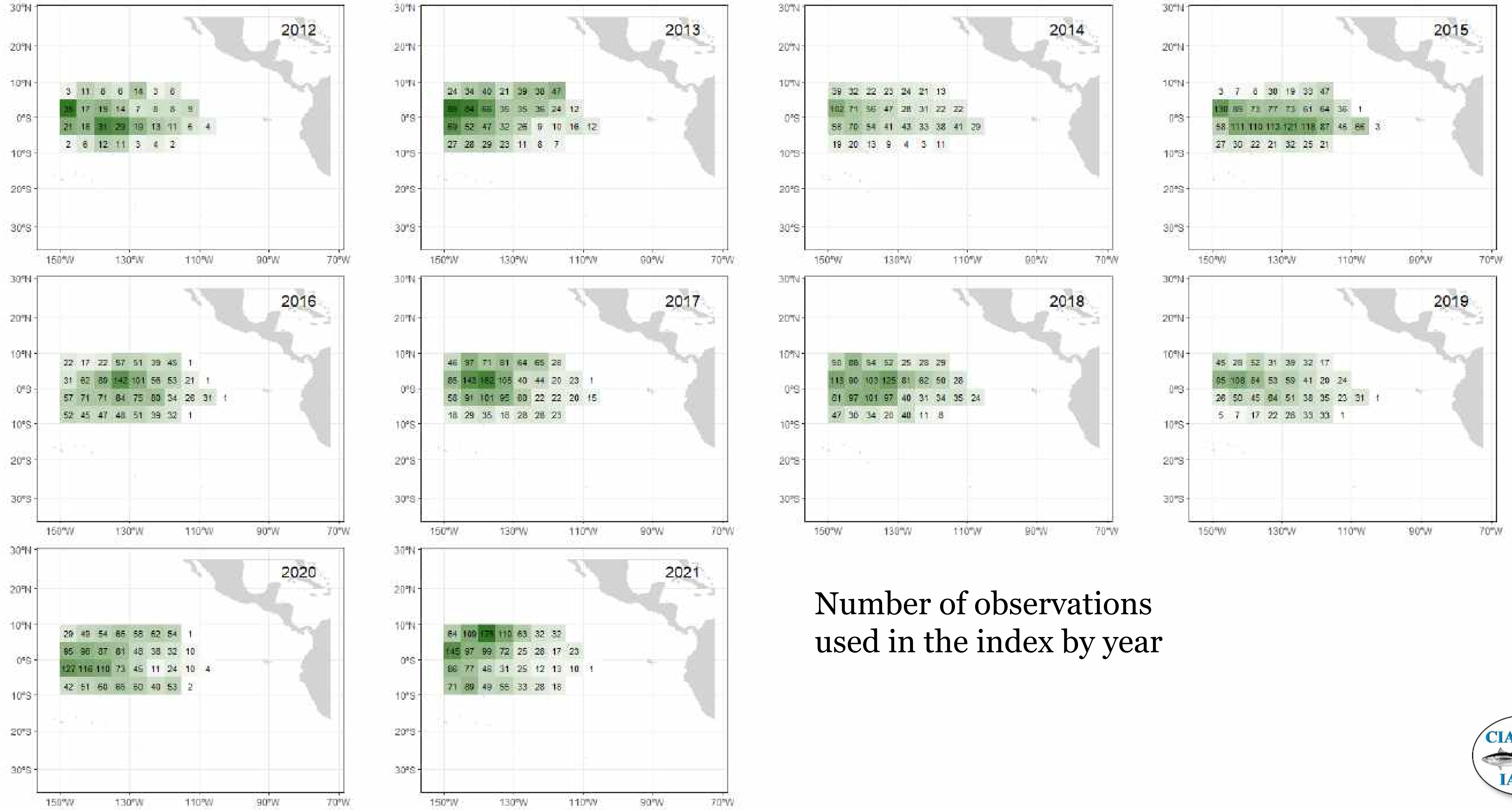
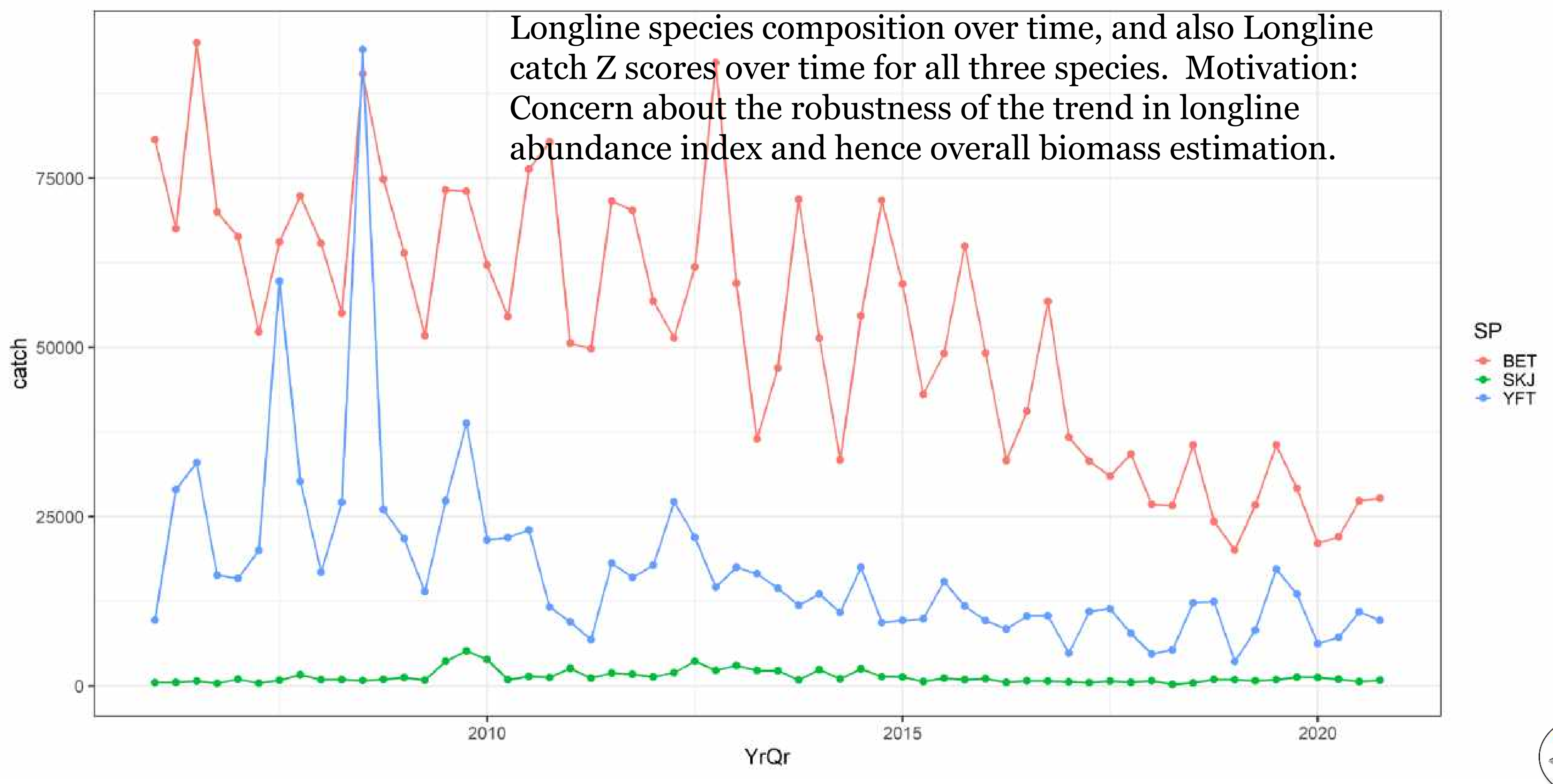


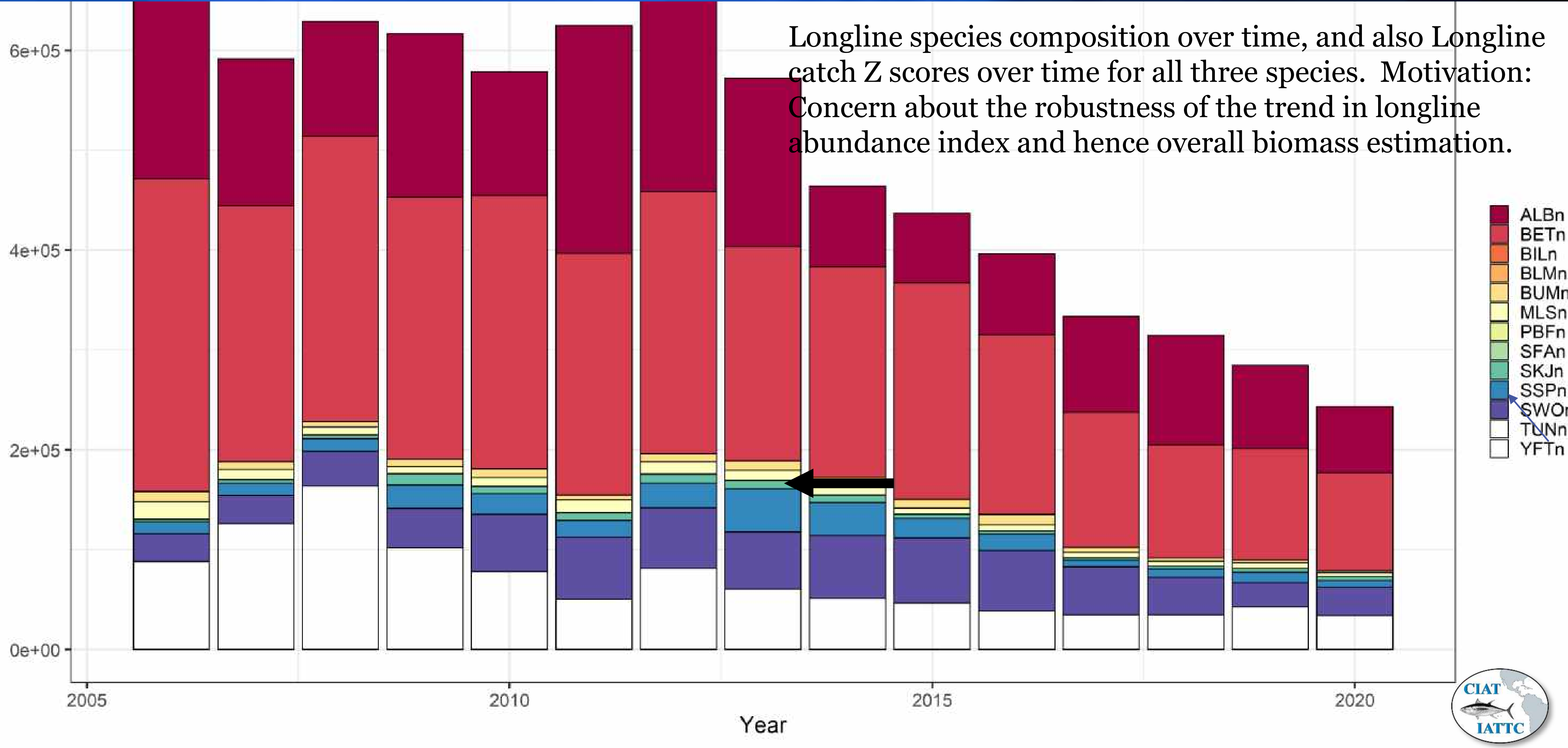
Number of observations used in the index by year

Request 2. Longline catches

Longline species composition over time, and also Longline catch Z scores over time for all three species. Motivation: Concern about the robustness of the trend in longline abundance index and hence overall biomass estimation.



Request 2 . Japanese longline catch composition



Longline species composition over time, and also Longline catch Z scores over time for all three species. Motivation: Concern about the robustness of the trend in longline abundance index and hence overall biomass estimation.

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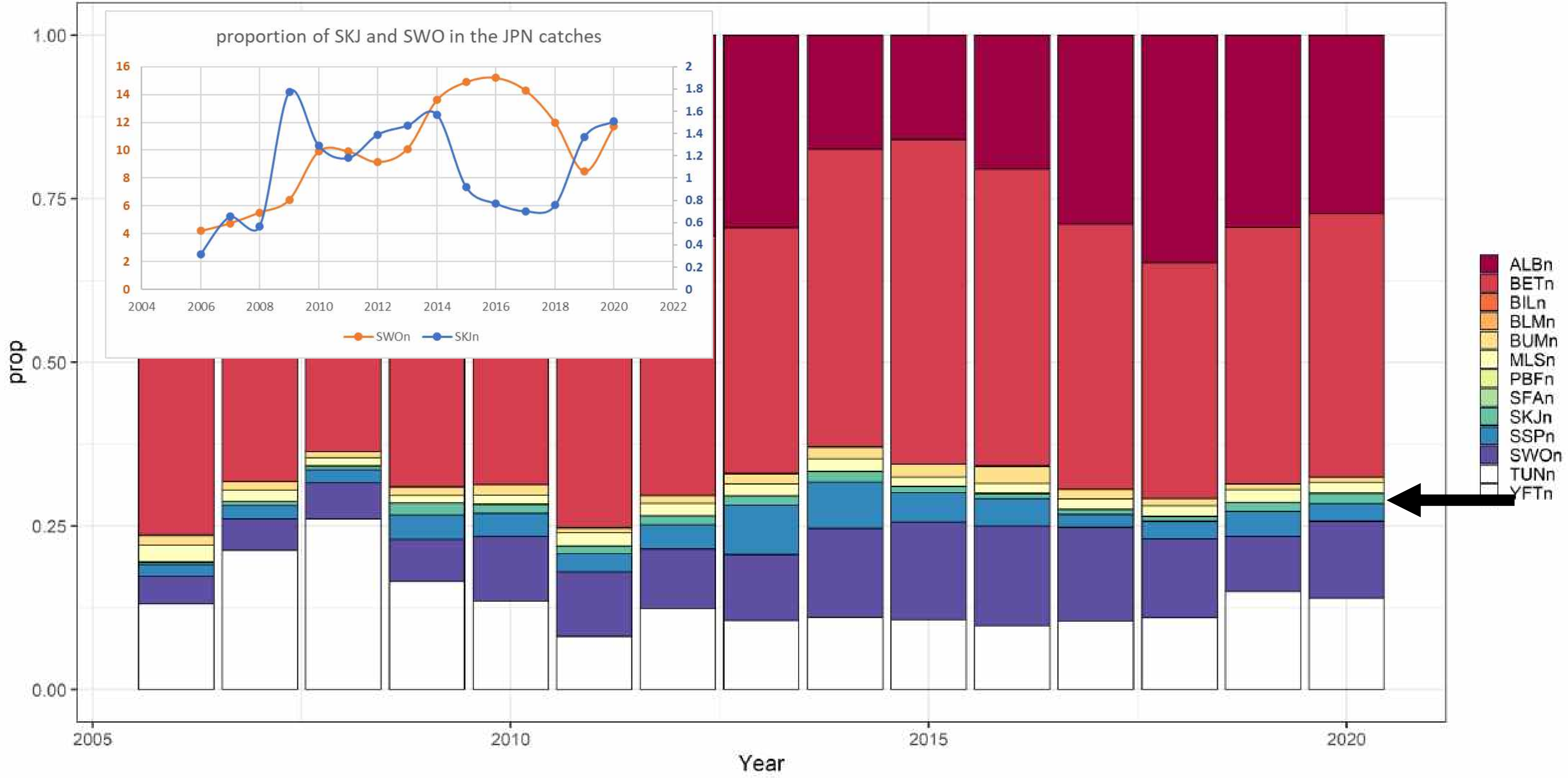
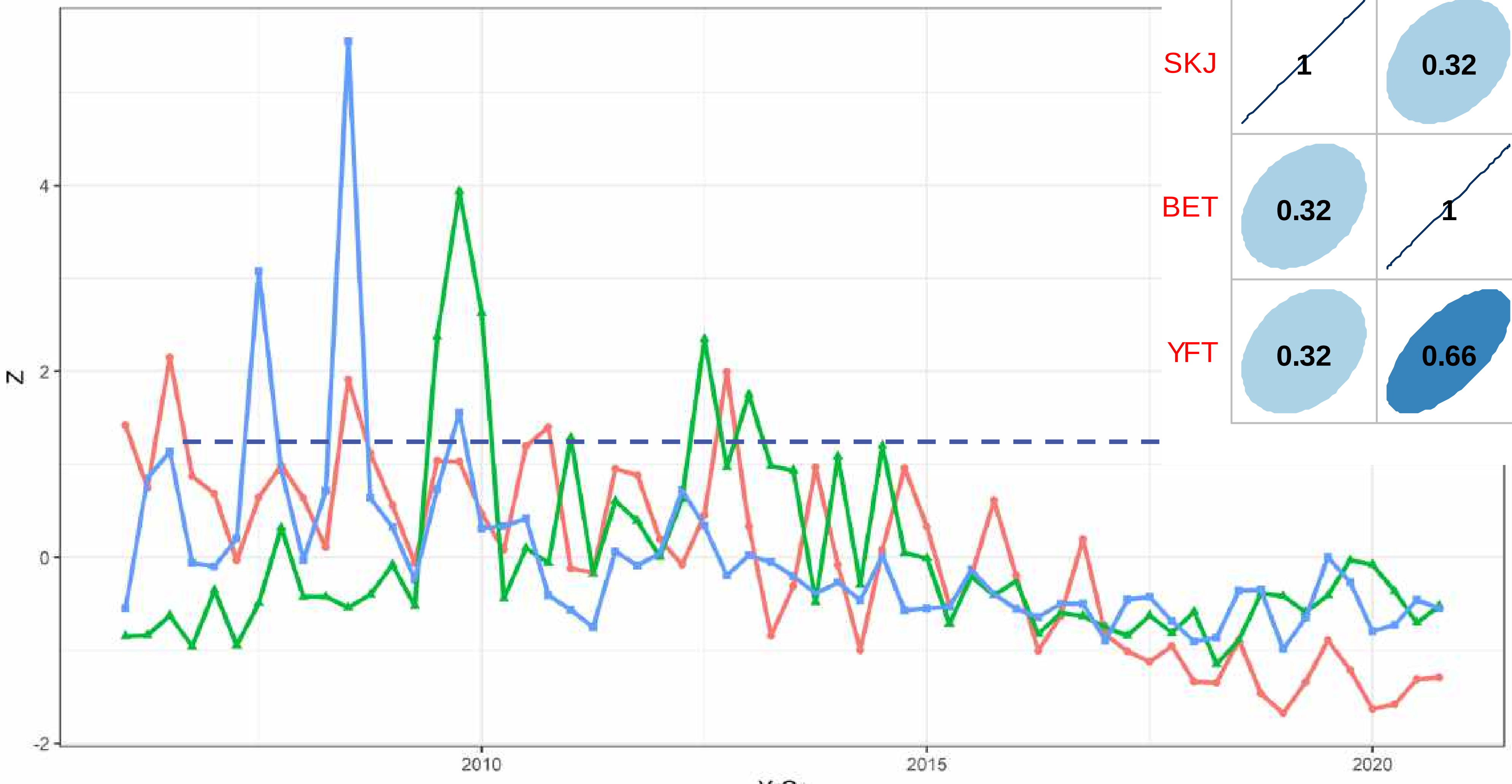
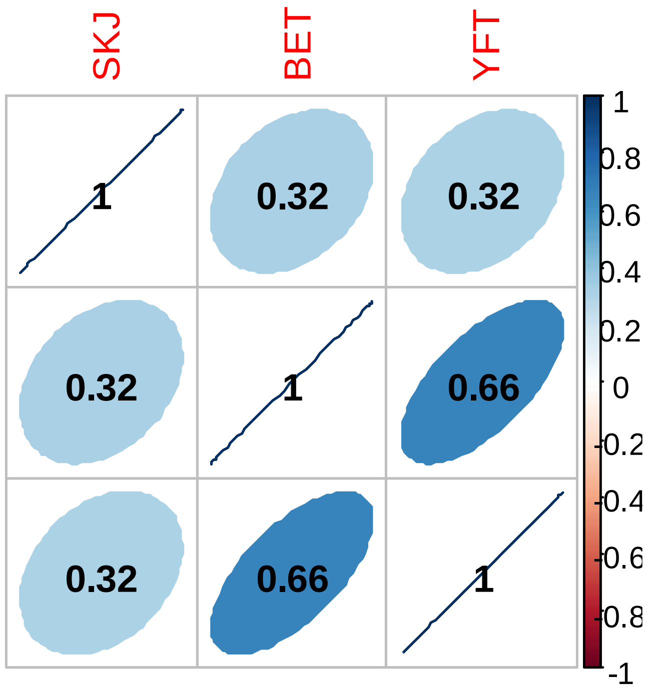


Request 2. Longline catches Z scores

Longline catch Z scores over time for all three species. Motivation: Concern about the robustness of the trend in longline abundance index and hence overall biomass estimation.

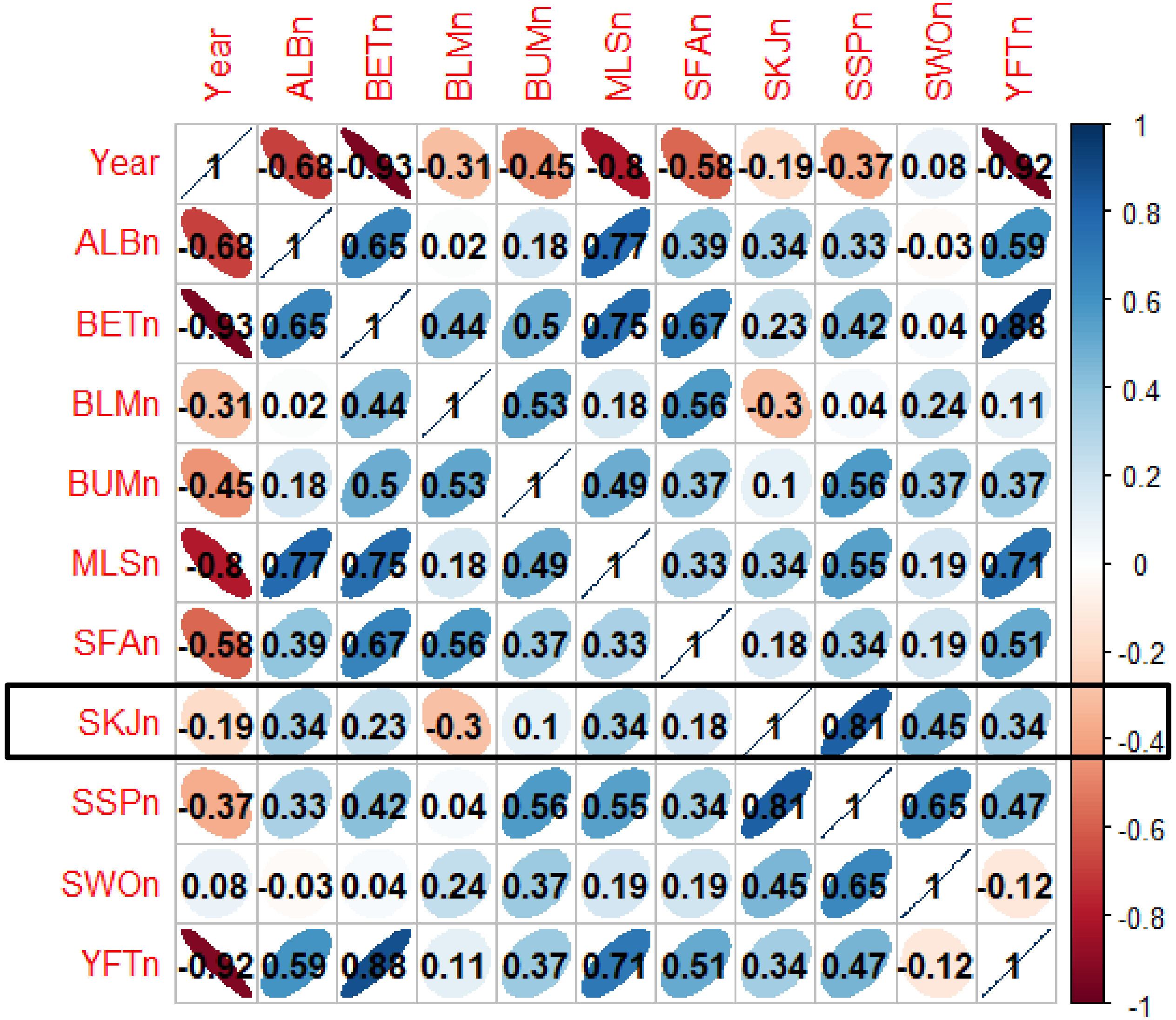


Correlations of log (Catches +1)

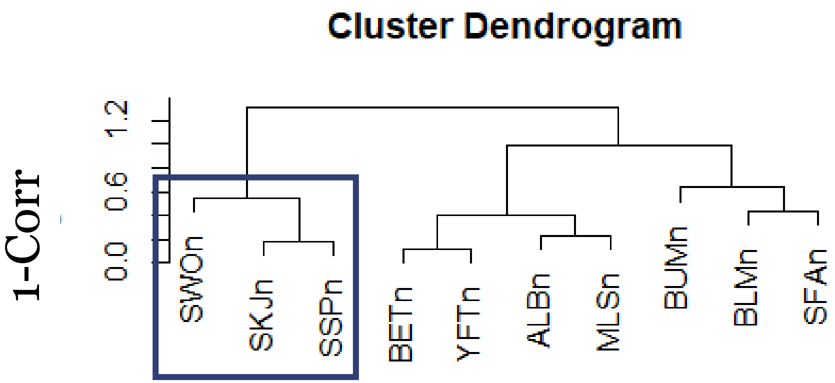


Request 2. Longline catches correlations

Spearman correlation



Correlations of log (Catches +1)

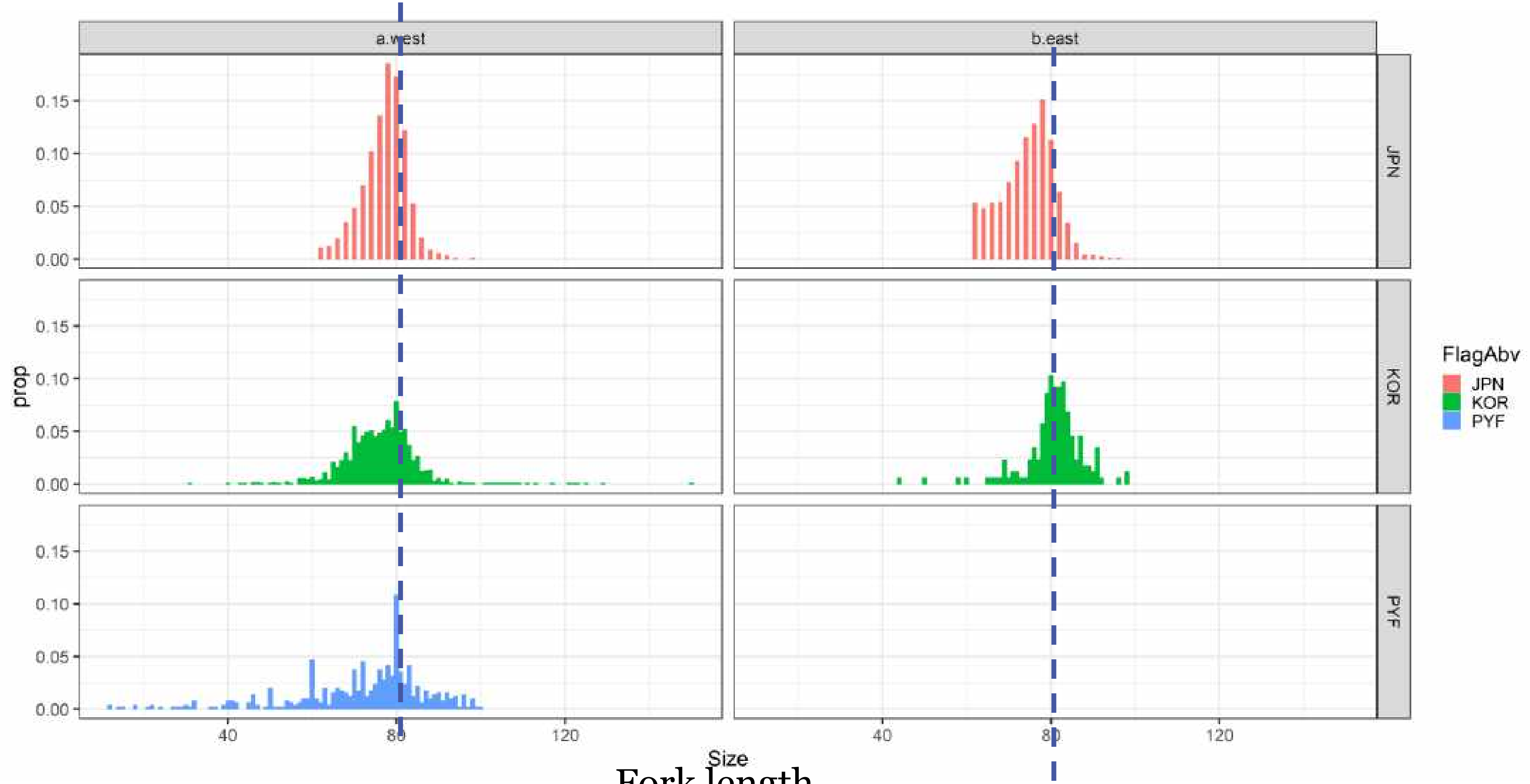


as.dist(t(1 - cor(log(Ca[3:12]) + 1, method = "spearman")))
hclust (*, "complete")

SSP Shortbill spearfish

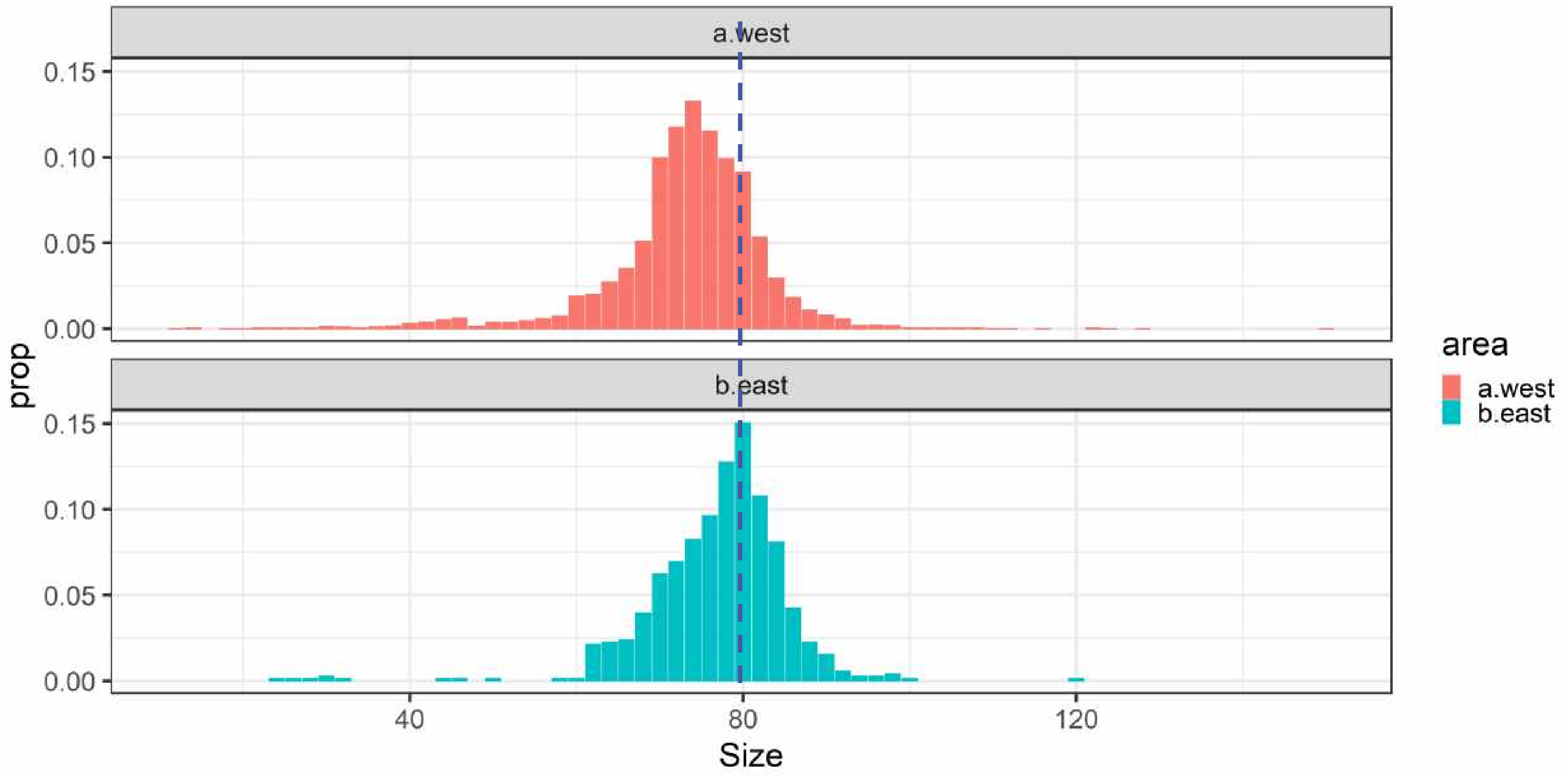
Request 3a. Longline length composition

For longline length comp data
Evaluate whether there is an effect of the data origin (by flag, or measured in Japanese training vessel, by observer or by crew) on the length frequency of skipjack, e.g., by comparing length comps of data subsets.



Fork length

Request 3a. Longline length composition: observer data



Fork length

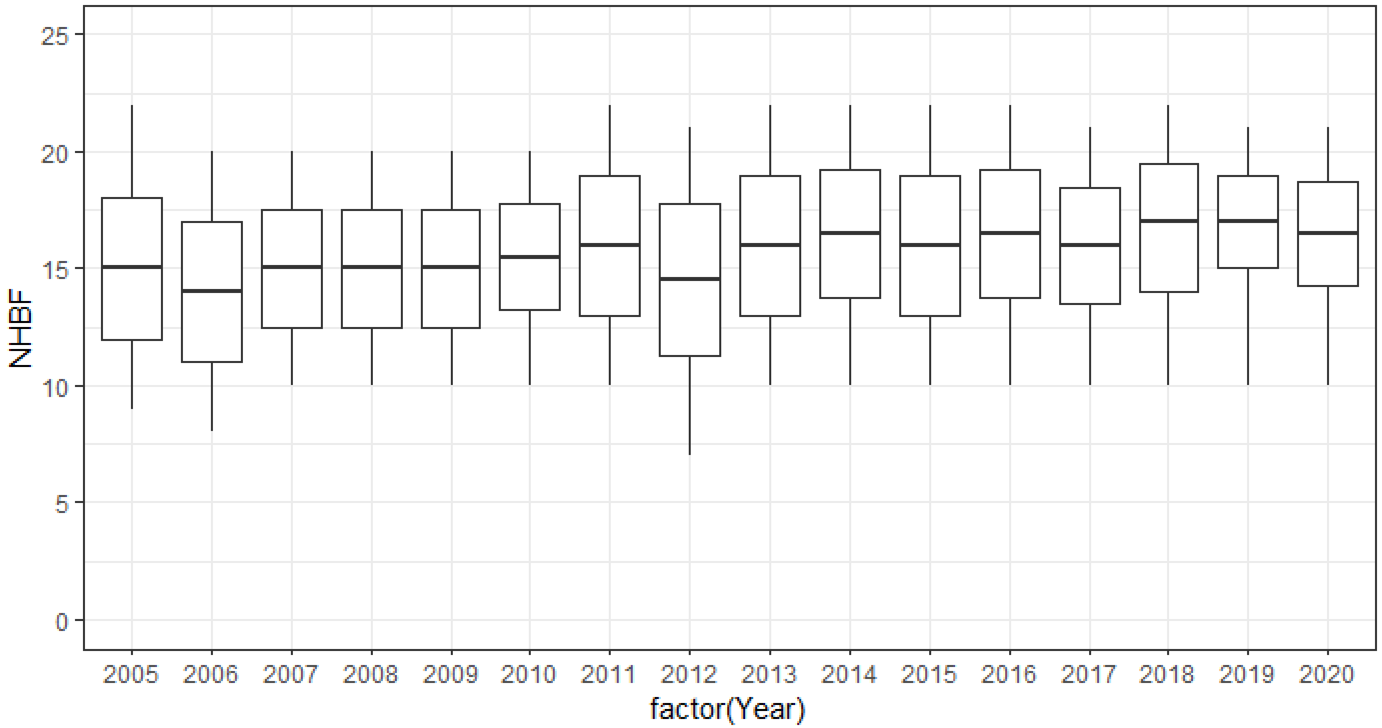
Request 3b. Longline length composition

Investigate whether the Japanese data was collected in length or was transformed from weight

Request 4. Are there any data on variables that could influence catchability of long line, such as hook size or hook depth?

Hooks-between-floats influences longline hook depth: a larger hooks-between-floats usually means a deeper set, which is likely cause decrease in SKJ (shallow-water species) catchability

Boxplot of HBF for the Japanese longline fishery in the EPO



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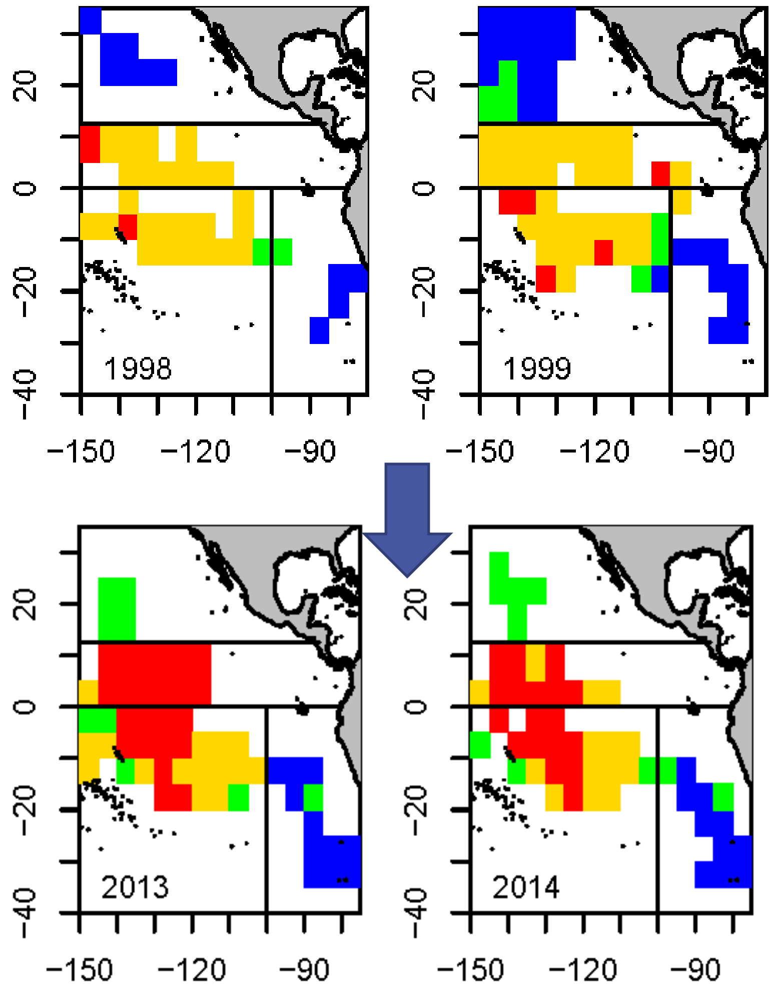
Hooks-between-floats influences longline hook depth:



blue < 15; green = 16; gold = 17; red > 17

Satoh et al SAC 2018

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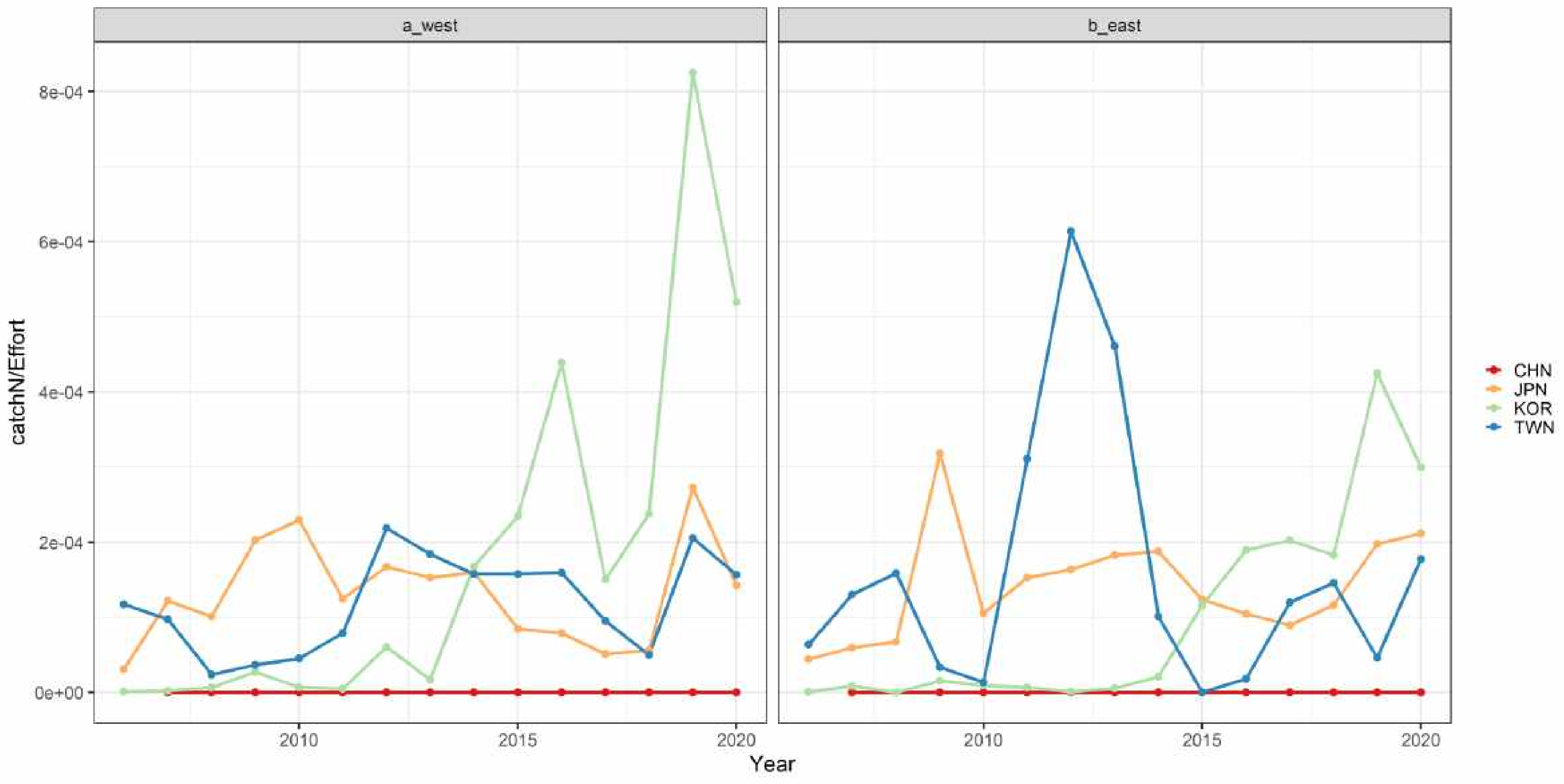
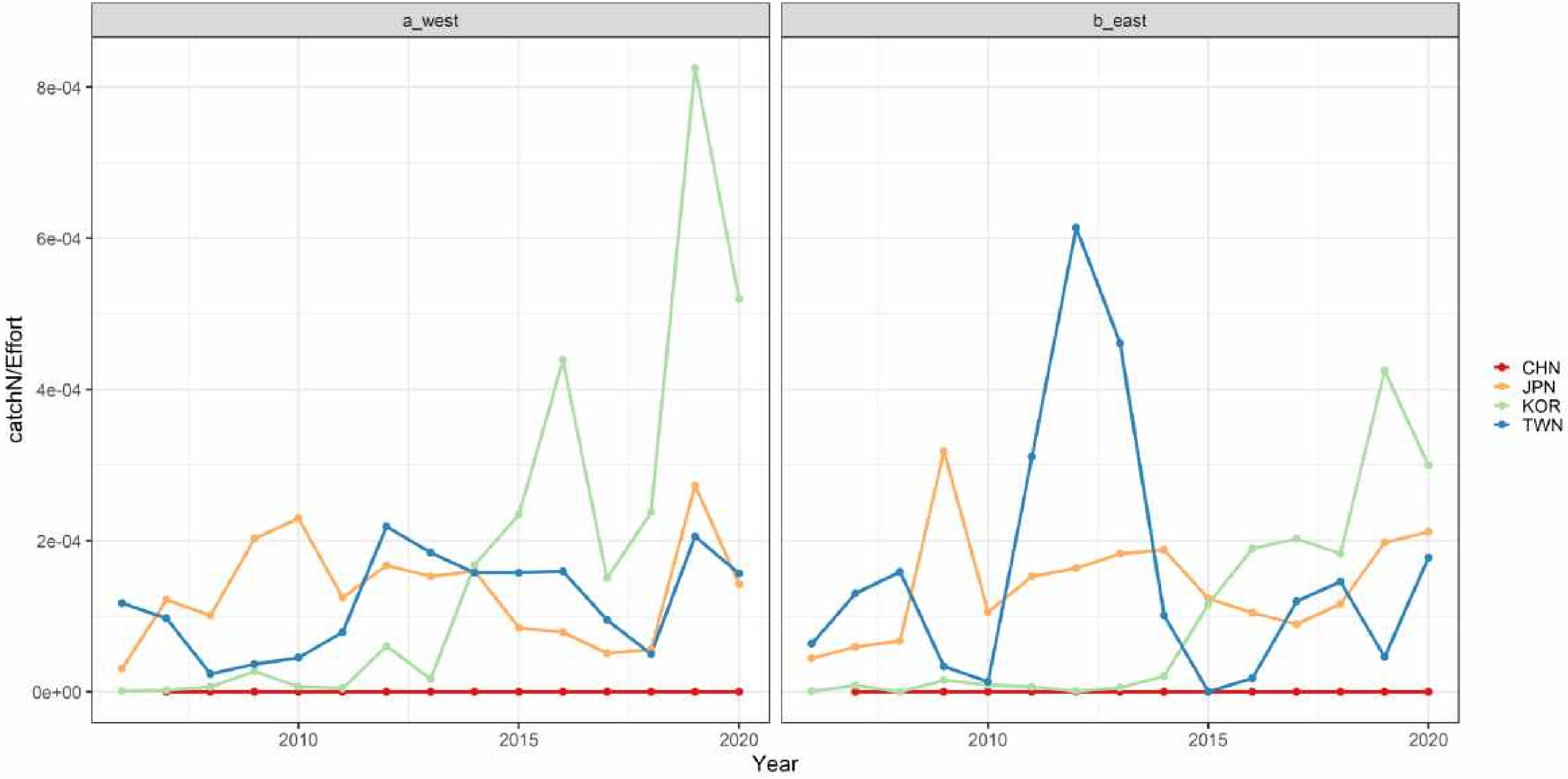
Request 5. Calculate cpue for longline data by east/west of 120.

We realize this will be sparse and perhaps with no observations for one of the regions in some years but looking to see if overall trend is potentially influenced by location.

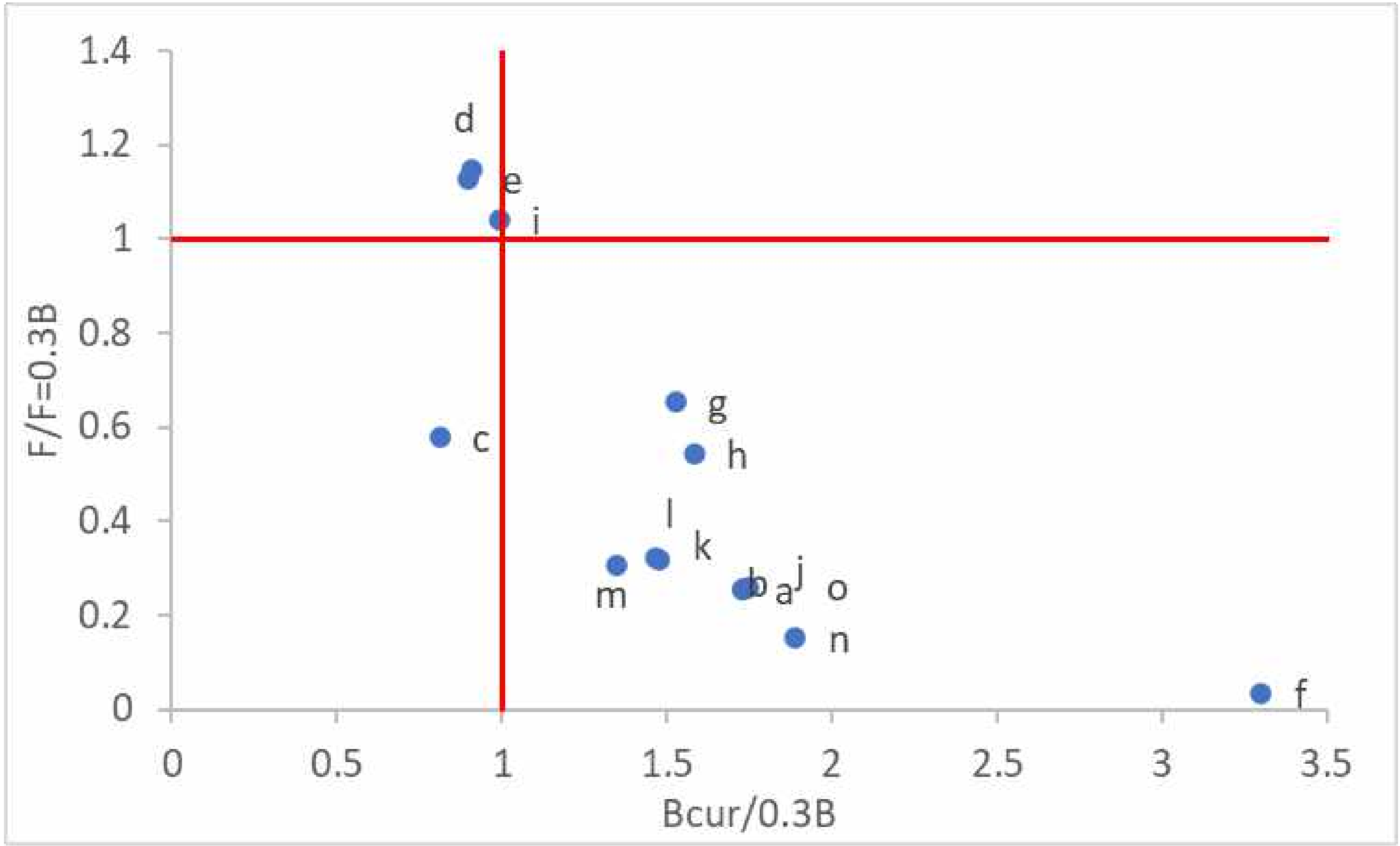


Request 5. Calculate cpue for longline data by east/west of 120.

We realize this will be sparse and perhaps with no observations for one of the regions in some years but looking to see if overall trend is potentially influenced by location.



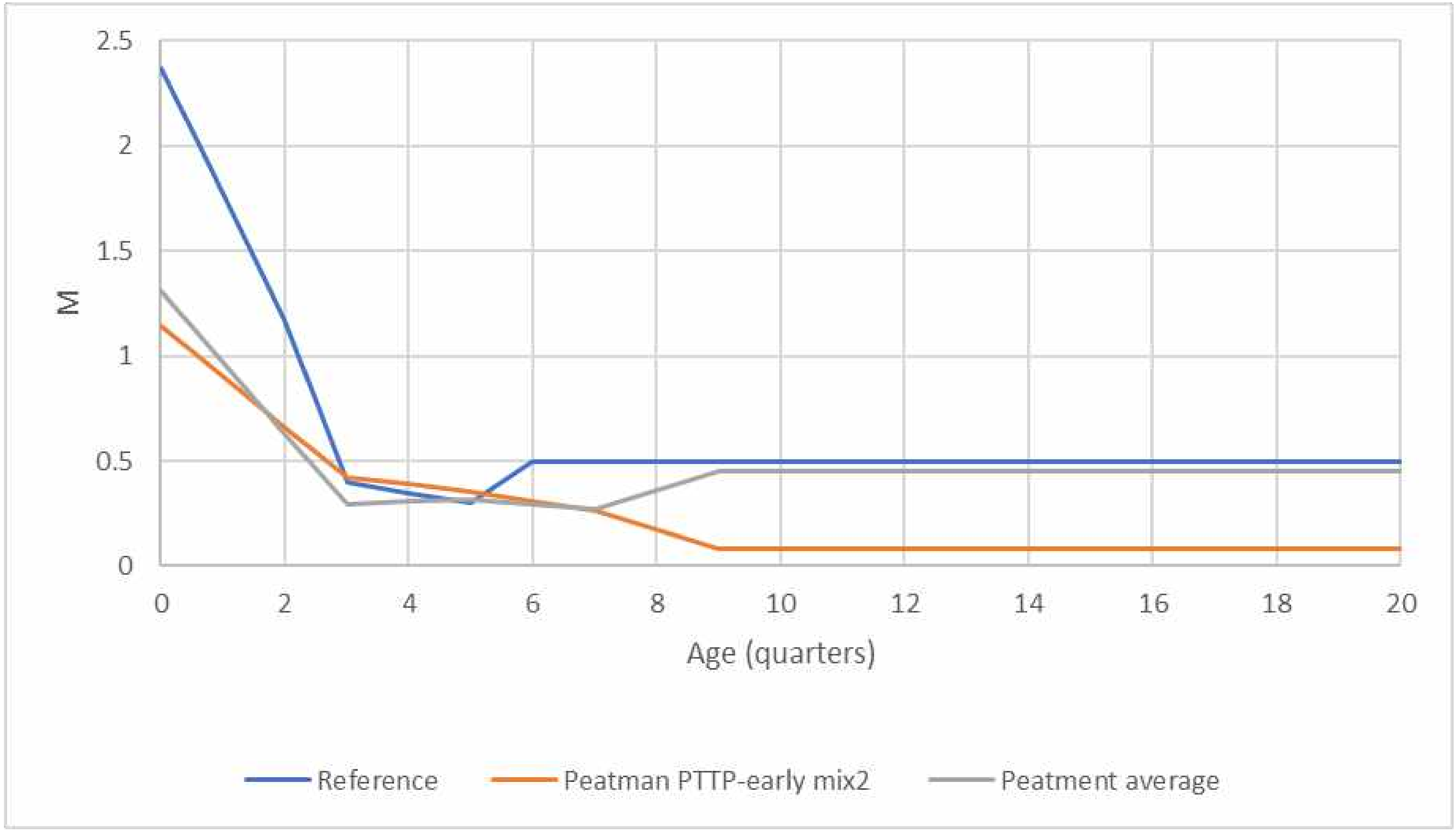
Request 7. Kobe plot



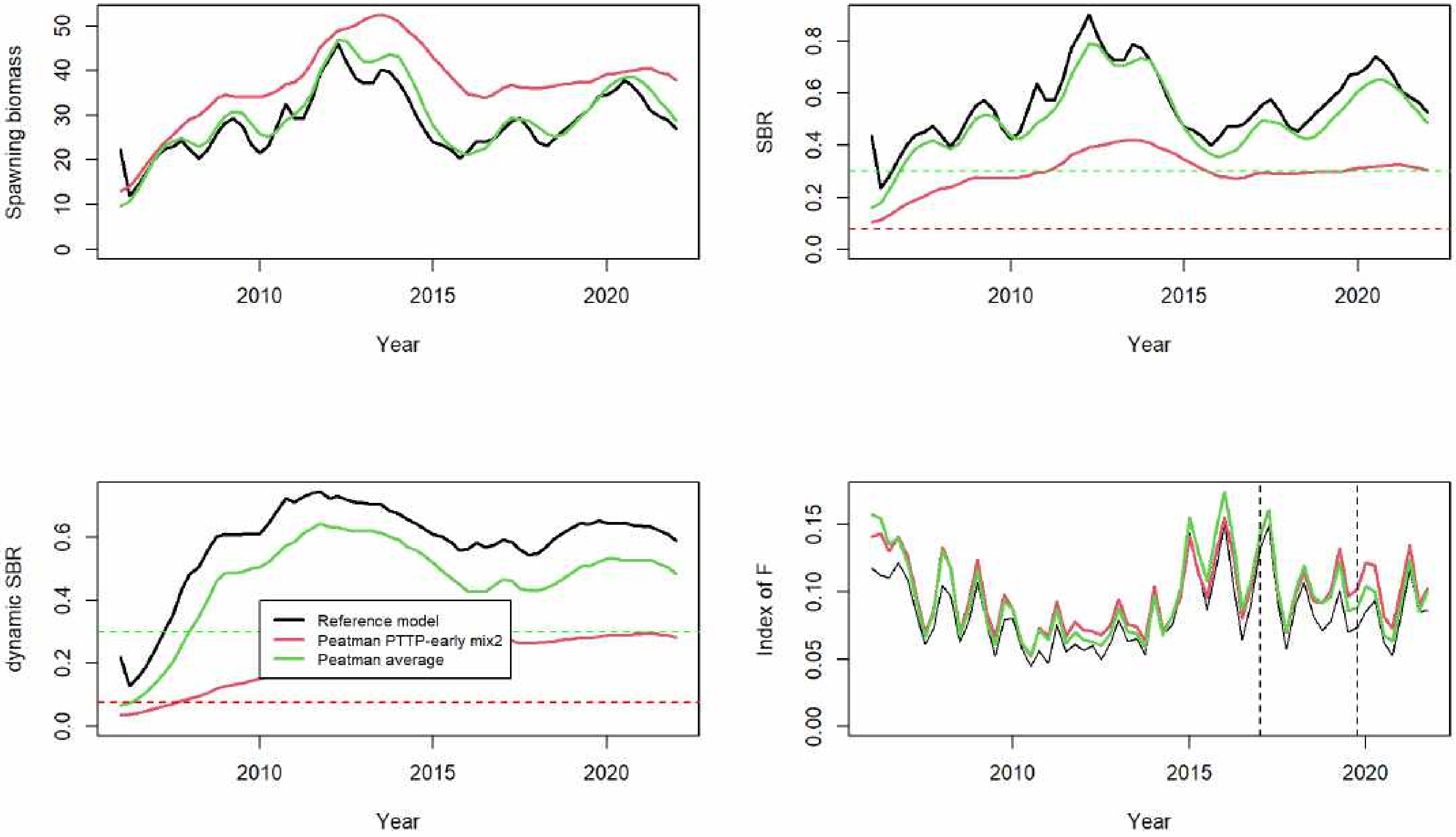
Request 7. Kobe plot

Code	Run	Bcur/B0	Bcur/0.3B	F/F=0.3B
a	Reference	0.52	1.73	0.25
b	Catch CV 0.1	0.52	1.73	0.25
c	Francis weighting	0.24	0.81	0.58
d	Lorenzen est M	0.27	0.91	1.15
e	Lorenzen est M A3	0.27	0.90	1.13
f	Lorenzen est M vonB	0.99	3.30	0.04
g	Lorenzen M	0.46	1.52	0.65
h	Peatman M Ave	0.48	1.58	0.54
i	Peatman PTTP	0.30	0.99	1.04
j	Rsd	0.52	1.74	0.26
k	Selectivity simple	0.44	1.48	0.32
l	Selectivity simple Not 0	0.44	1.46	0.32
m	No LL index or comp	0.40	1.35	0.31
n	No LL index	0.57	1.89	0.15
o	Tail Compression	0.52	1.73	0.25

Request 8. Peatman M



Request 8. Peatman M

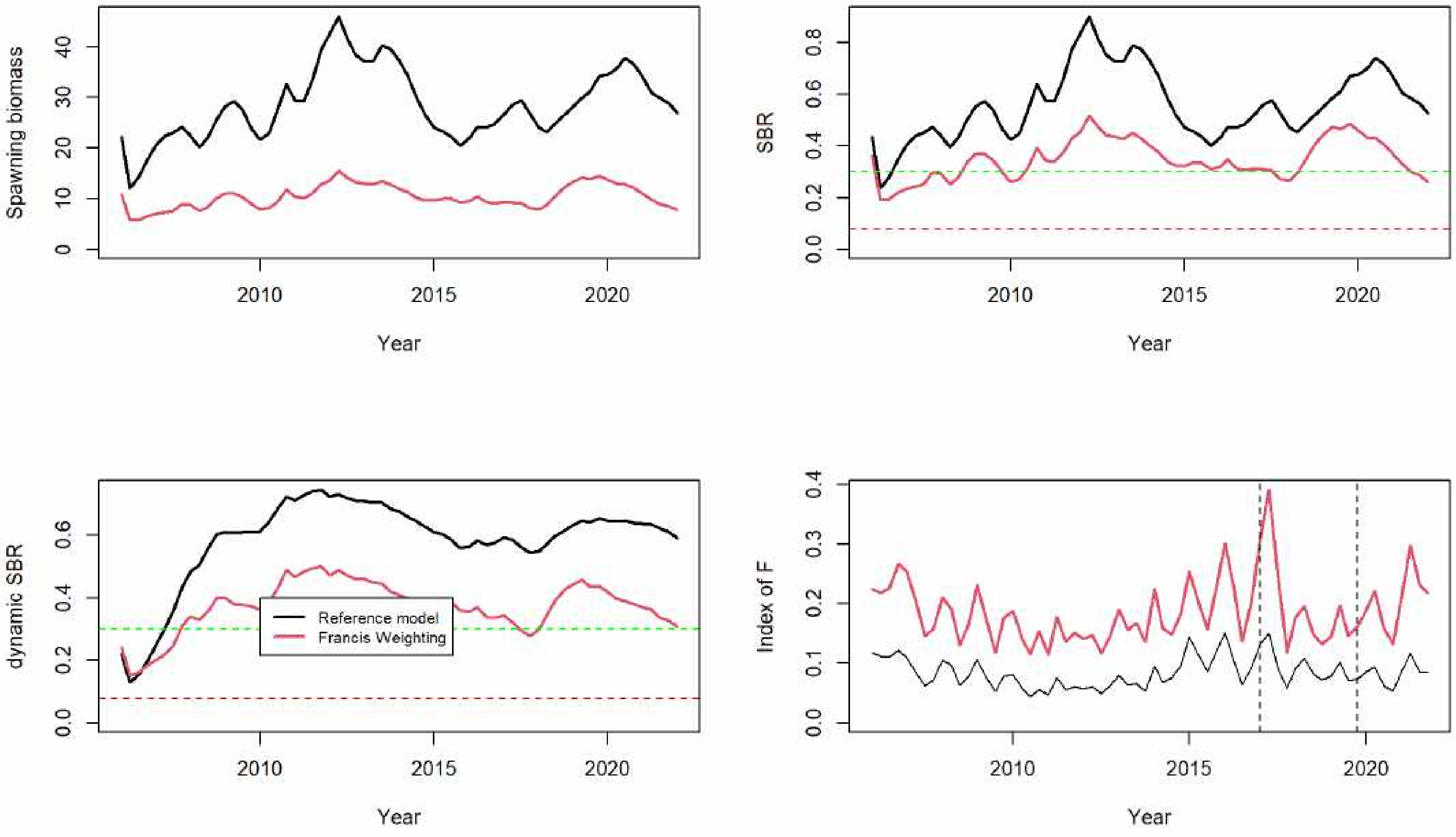


Request 8. Peatman M

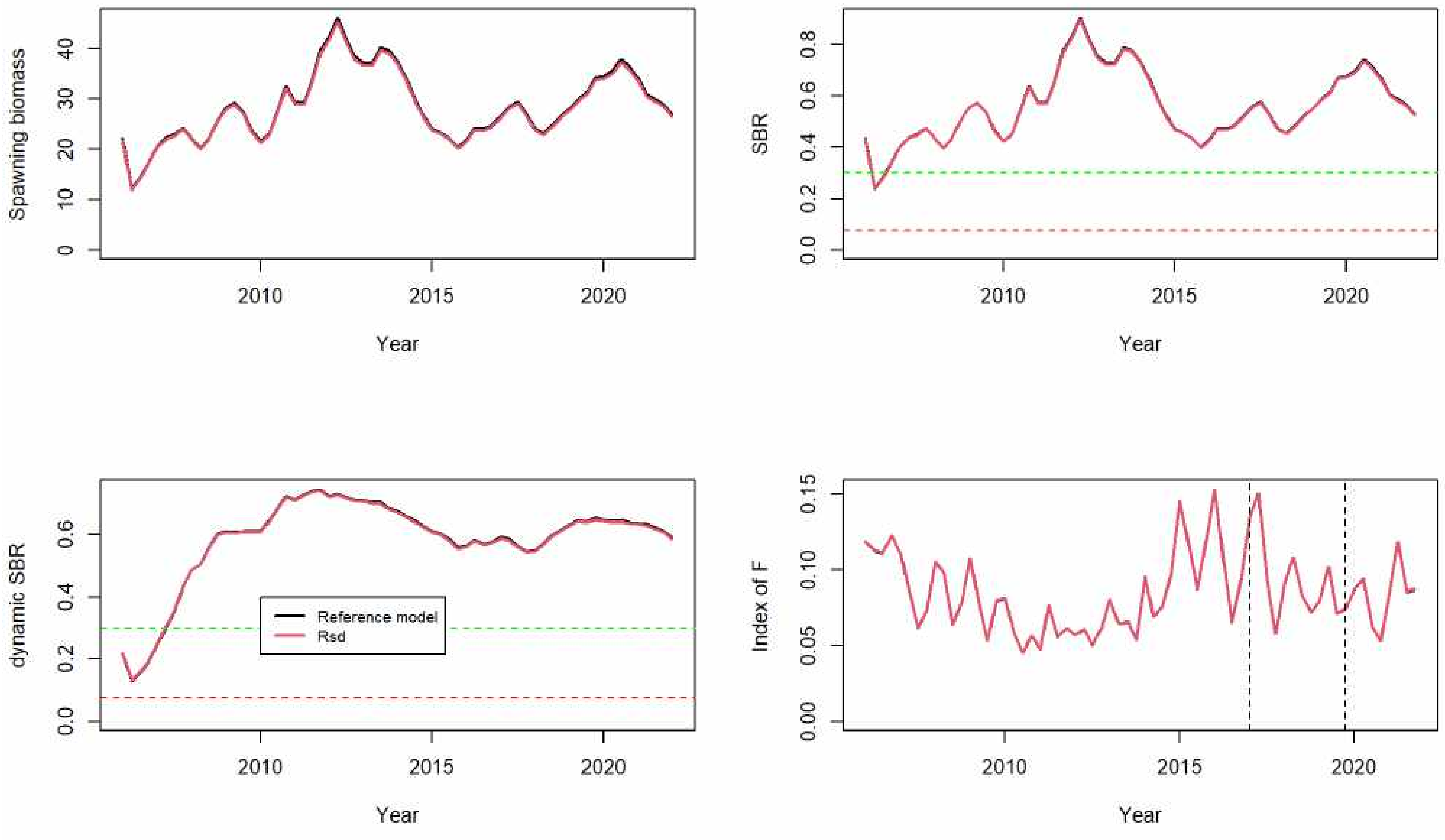
Reference	Lorenzen	Lorenzen estM	Lorenzen estM A3	Lorenzen estM vonB	PTTP-early with a mixing period of 2 quarters	Average
2628	2583	2560	2548	4551	2581	2608
80	35	12	0	2002	33	60

Request 9. Francis weighting

1	0.34
2	0.35
3	0.40
4	0.25
5	0.14
6	0.16
7	0.26
8	0.15
9	0.05
10	0.42
11	NA
12	0.05
13	0.11



Request 10. Rsd = 0.566517917



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