Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission

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History of the yellowfin assessment and issues identified

Carolina Minte-Vera, Mark N. Maunder, Alexandre Aires-da-Silva, and Haikun Xu

2nd External review of the stock assessment of yellowfin tuna in the EPO, La Jolla, California USA, 2-8 December 2019

Outline

- History of the stock assessment
- Issues identified
- Explorations
- Recommendations from YFT-01

Stock assessment history

Stock Synthesis

STATUS OF YELLOWFIN TUNA IN THE EASTERN PACIFIC OCEAN IN 2008 AND OUTLOOK FOR THE FUTURE

Mark N. Maunder and Alexandre Aires-da-Silva

A-Scala

Number	
20	2019. Status of the tuna and billfish stocks in 2018
19	2018. Status of the tuna and billfish stocks in 2017
18	2018. Status of the tuna and billfish stocks in 2016
17	2018. Status of the tuna and billfish stocks in 2015
16	2015. Status of the tuna and billfish stocks in 2014
15	2014. Status of the tuna and billfish stocks in 2013
14	2014. Status of the tuna and billfish stocks in 2012
13	2012. Status of the tuna and billfish stocks in 2011
12	2012. Status of the tuna and billfish stocks in 2010
11	2011. Status of the tuna and billfish stocks in 2009
10	2010. Status of the tuna and billfish stocks in 2008
9	2009. Status of the tuna and billfish stocks in 2007
8	2007. Status of the tuna and billfish stocks in 2006
7	2007. Status of the tuna and billfish stocks in 2005
6	2006. Status of the tuna and billfish stocks in 2004
5	2005. Status of the tuna and billfish stocks in 2003
4	2004. Status of the tuna and billfish stocks in 2002
3	2002. Status of the tuna and billfish stocks in 2001
2	2002. Status of the tuna and billfish stocks in 2000
1	2001. Status of the tuna and billfish stocks in 1999

BET-02, YFT-02

YFT rejected

BET assessment rejected by the staff, indicators produced

YFT-01

BET-01 external review

Previously: Cohort analysis, production models

Based solely on purse-seine and baitboat data

Issues

- The management quantities are sensitive to the inclusion of the 2018 data for the longline index of abundance.
- Inconsistencies between Japanese longline index and the dolphin-associated purse-seine index
- Changes in the length composition for the longline fishery

Background

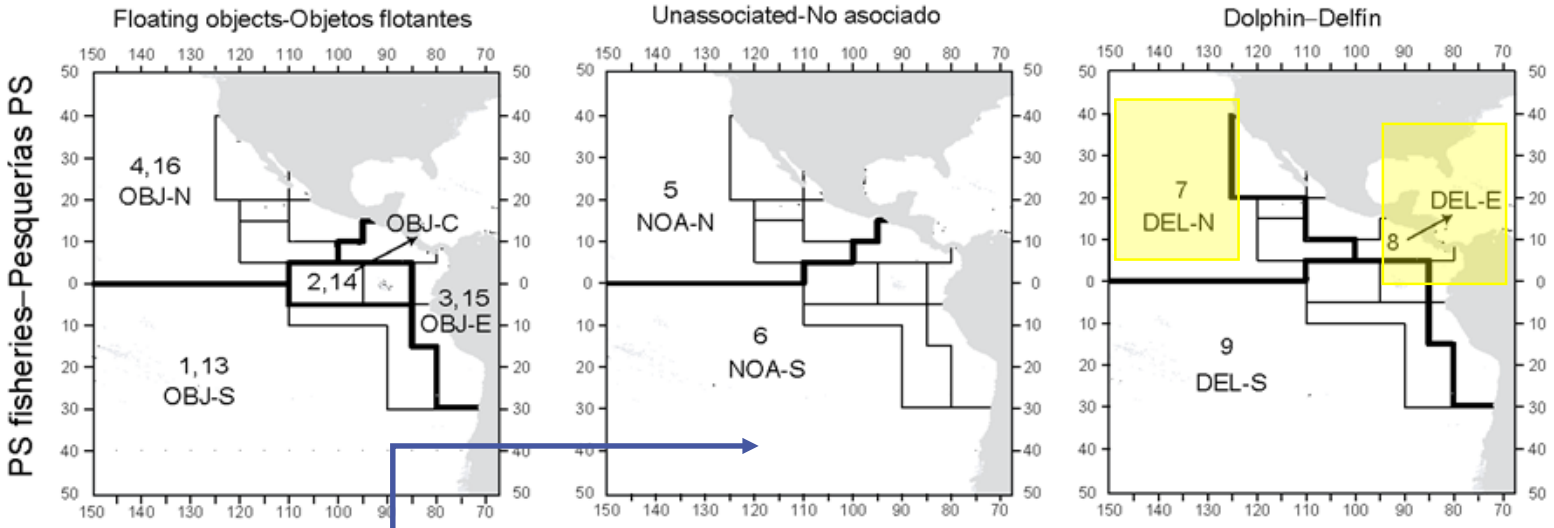
- Data from Japan
- Standardization
- Main index of abundance
- Issues highlighted with the 2018 BET assessment
- YFT assessment was thought robust
- Five indices of abundance and length composition data
- In 2019 assessment results driven by the longline-derived index of abundance
- Longline workshop – many lessons learnt

MSY and related quantities

YFT	SAC 9 Base case Caso base	SAC 10 Base case Caso base	SAC 10 Base case except update LL_S
MSY-RMS	264,283	254,975	254,872
B_{MSY}- B_{RMS}	376,696	371,787	372,247
S_{MSY}- S_{RMS}	3,634	3,638	3,642
B_{MSY}/B_0- B_{RMS}/B_0	0.31	0.31	0.31
S_{MSY}/S_0- S_{RMS}/S_0	0.27	0.27	0.27
C_{recent}/MSY- $C_{reciente}$/RMS	0.85	1.00	1.00
B_{recent}/B_{MSY}- $B_{reciente}/B_{RMS}$	1.35	0.84	1.03
S_{recent}/S_{MSY}-$S_{reciente}/S_{RMS}$	1.08	0.76	0.99
F multiplier-Multiplicador de *F*	0.99	0.89	1.00

- Results driven by the update in the longline-based index of abundance
- The rest of the new (or updated) data:
  - ✓ Do not show indication of increase in fishing mortality
  - ✓ Decline in biomass not so strong

YFT fishery definitions and indices (SAC 10)

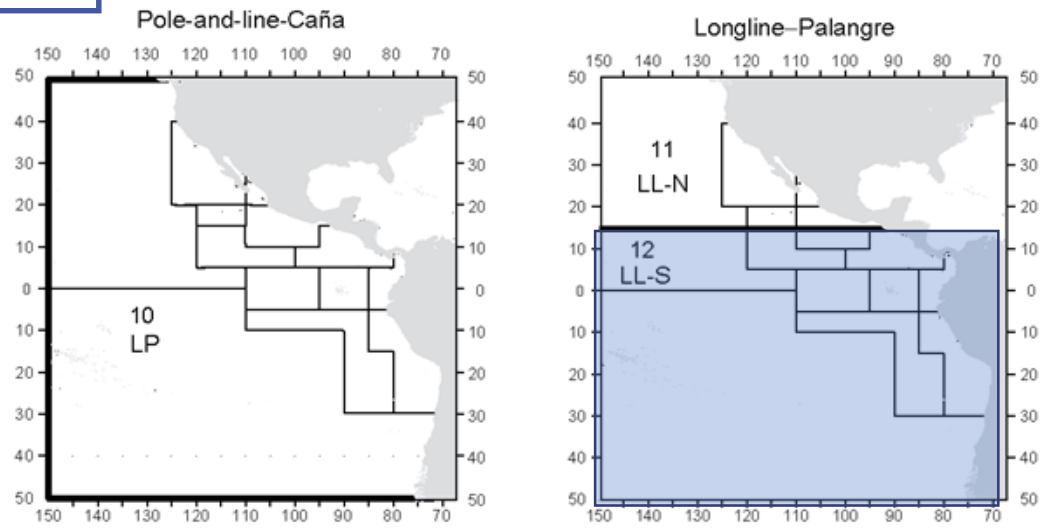


Secondary indices

DEL-N
DEL-E

Secondary indices

NOA-N
NOA-S

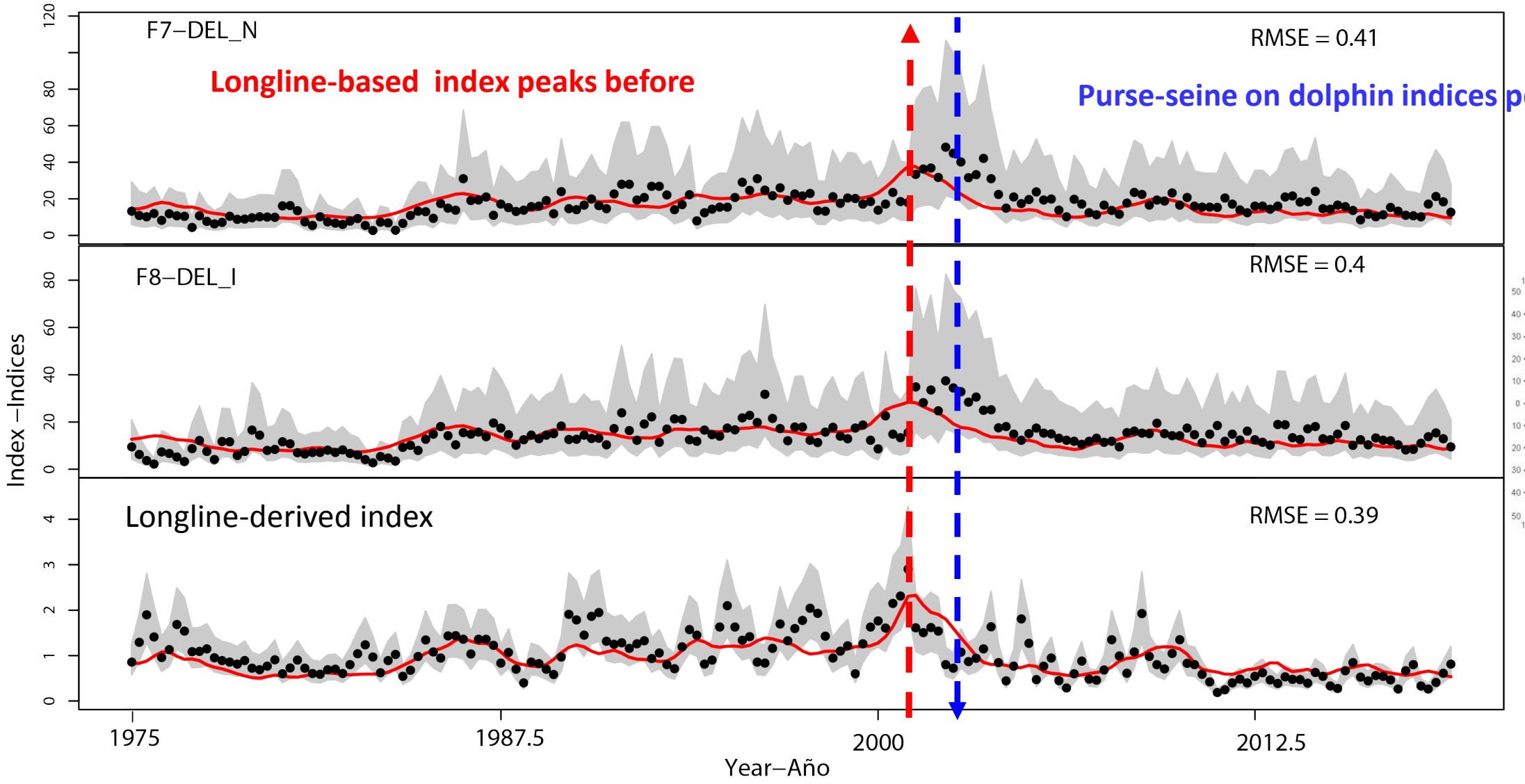


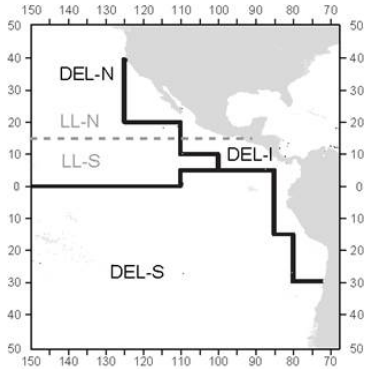
Main index: longline index of abundance
LL-S

___ IATTC length-frequency sampling areas

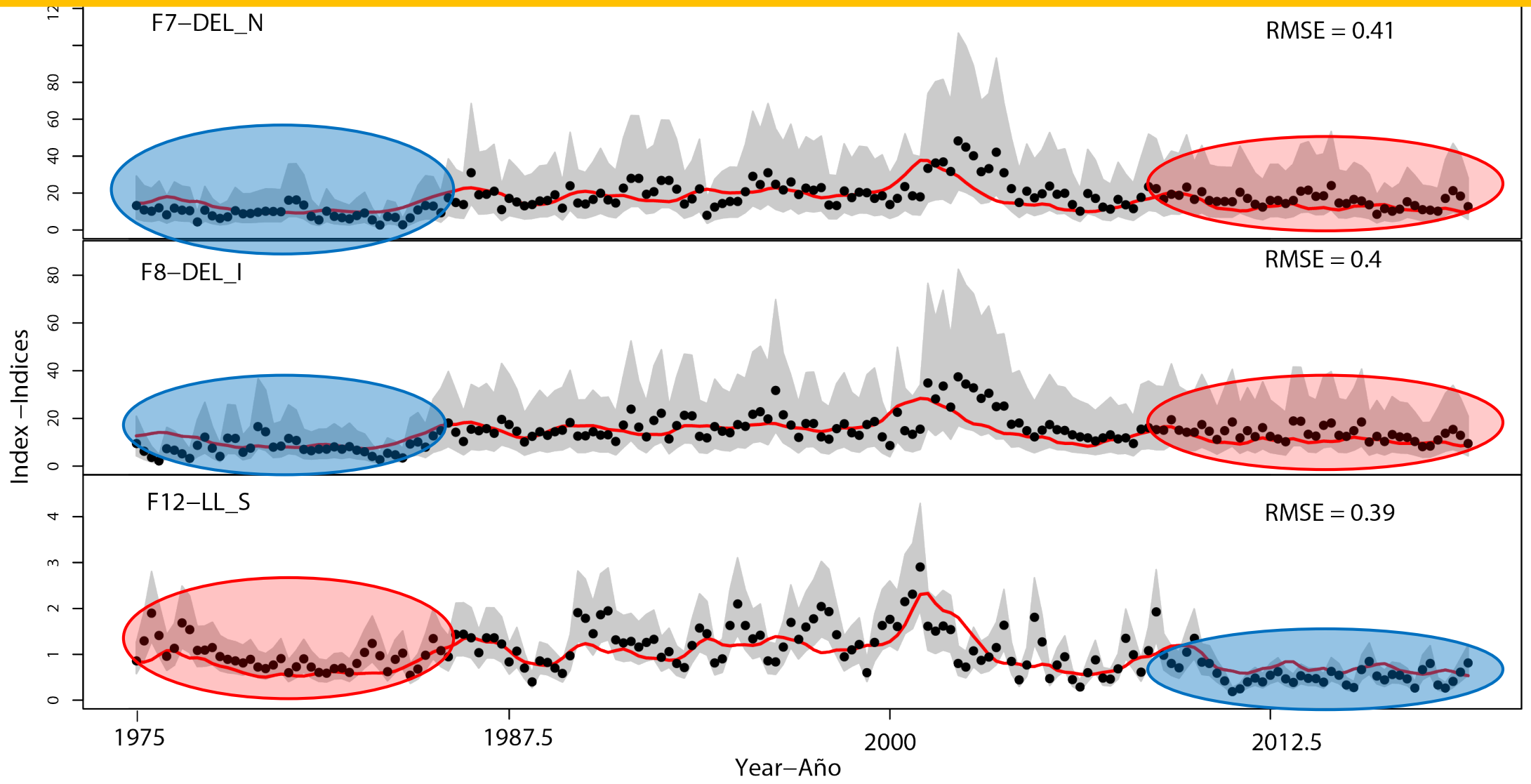
___ fishery definition areas

Inconsistencies among indices

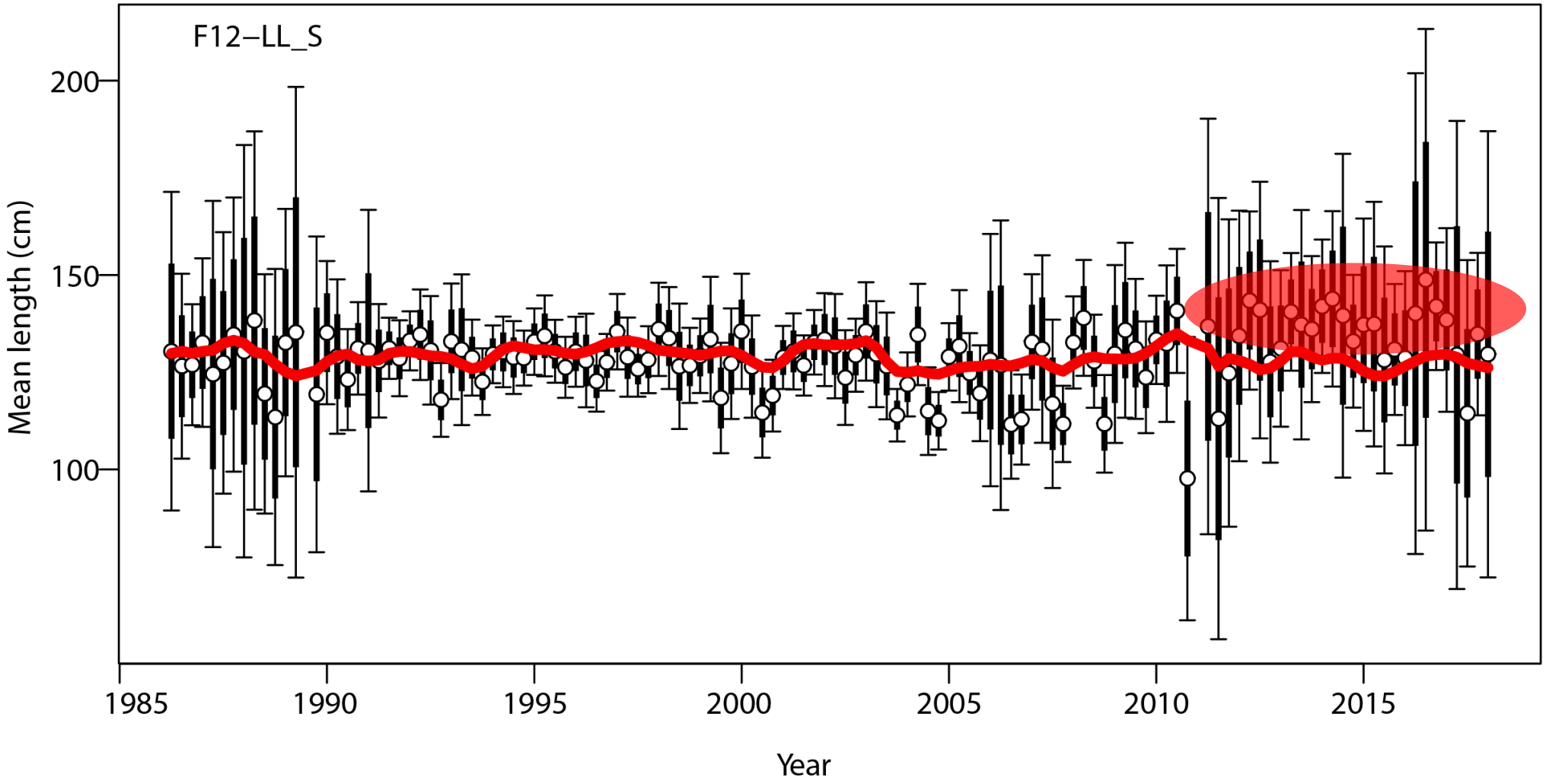




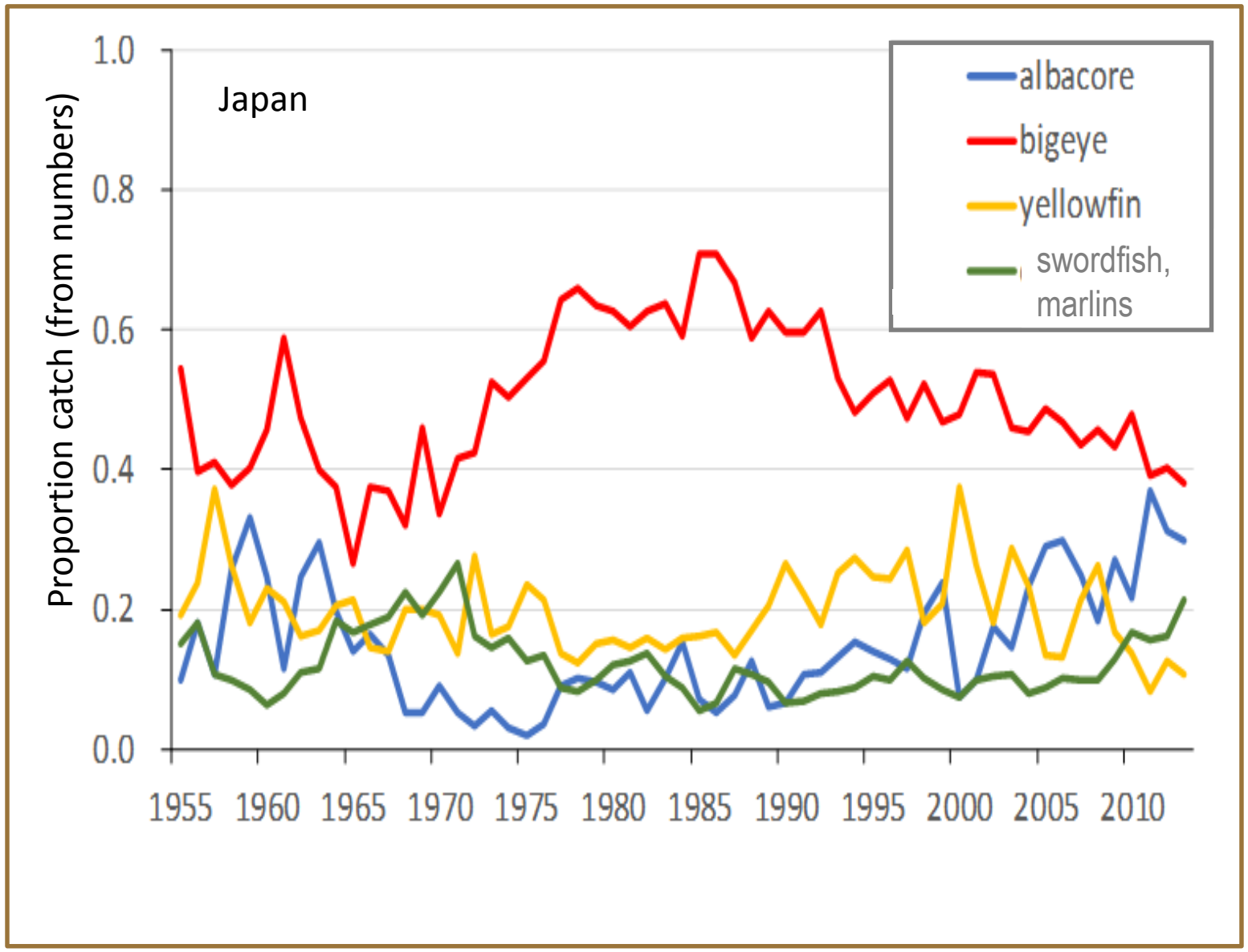
Inconsistencies among indices



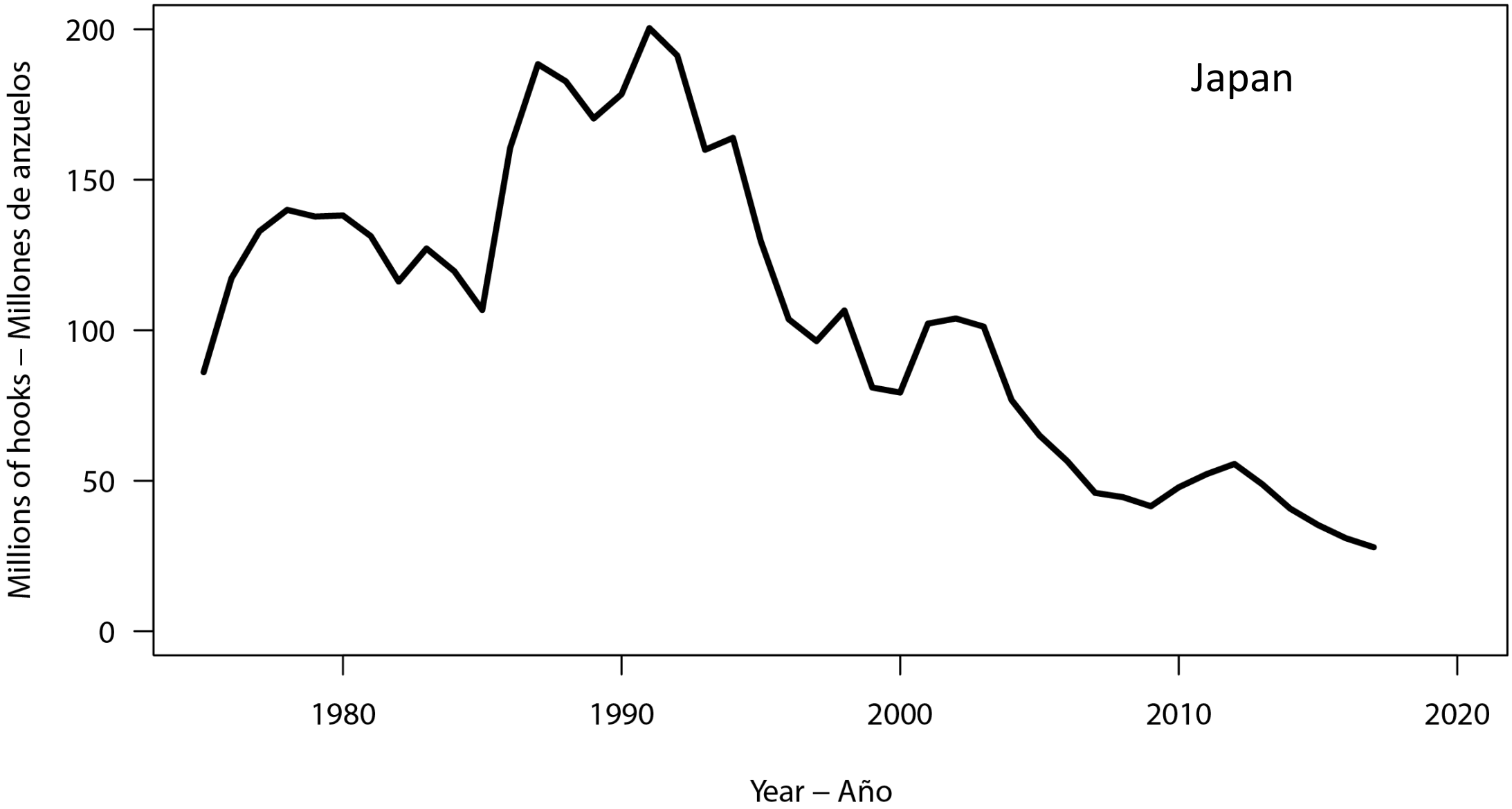
Change in longline length composition



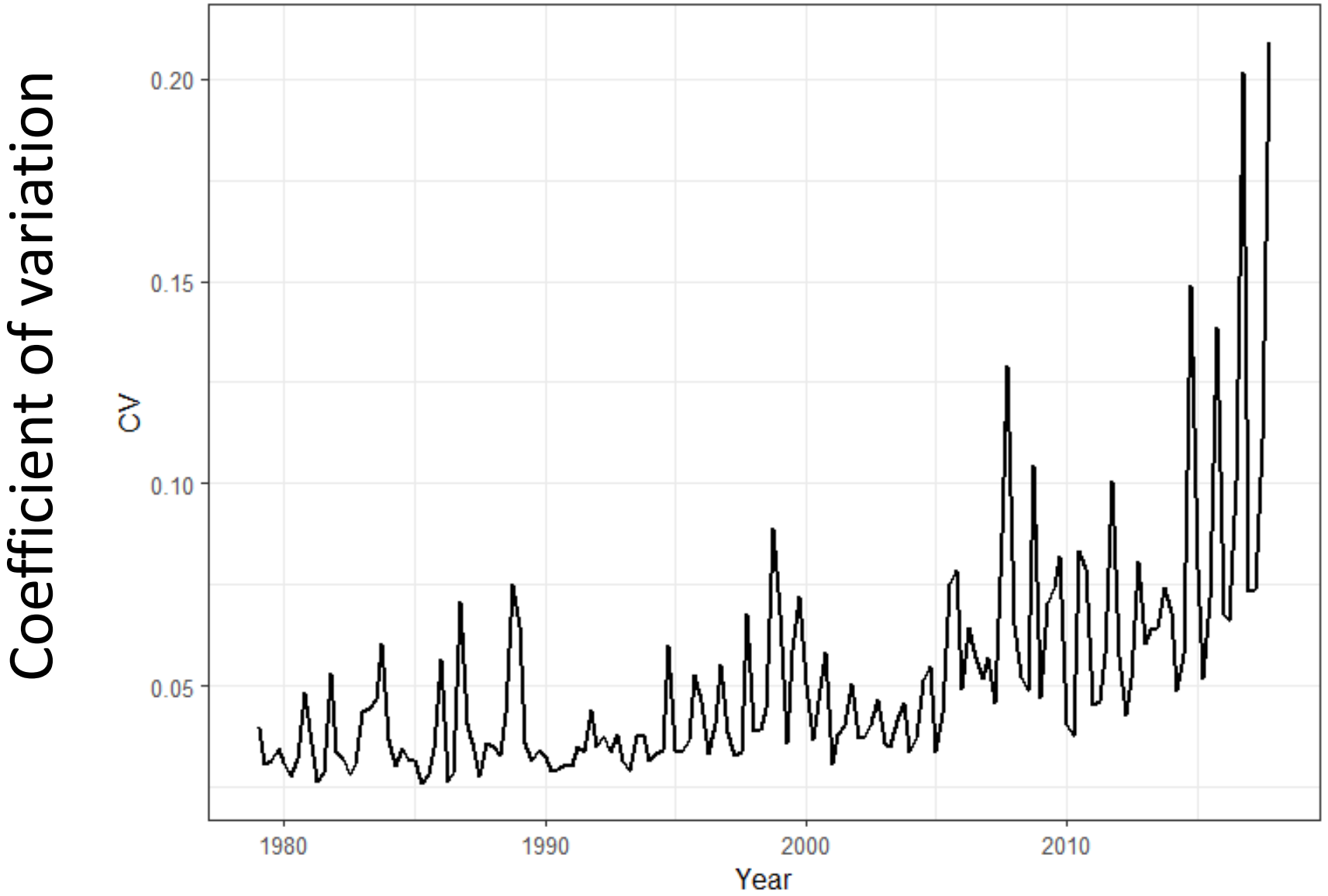
Issues with the longline index: potential change in target



Issues with the longline index : Decrease of effort over time



Issues with the longline index : CV of the index is increasing

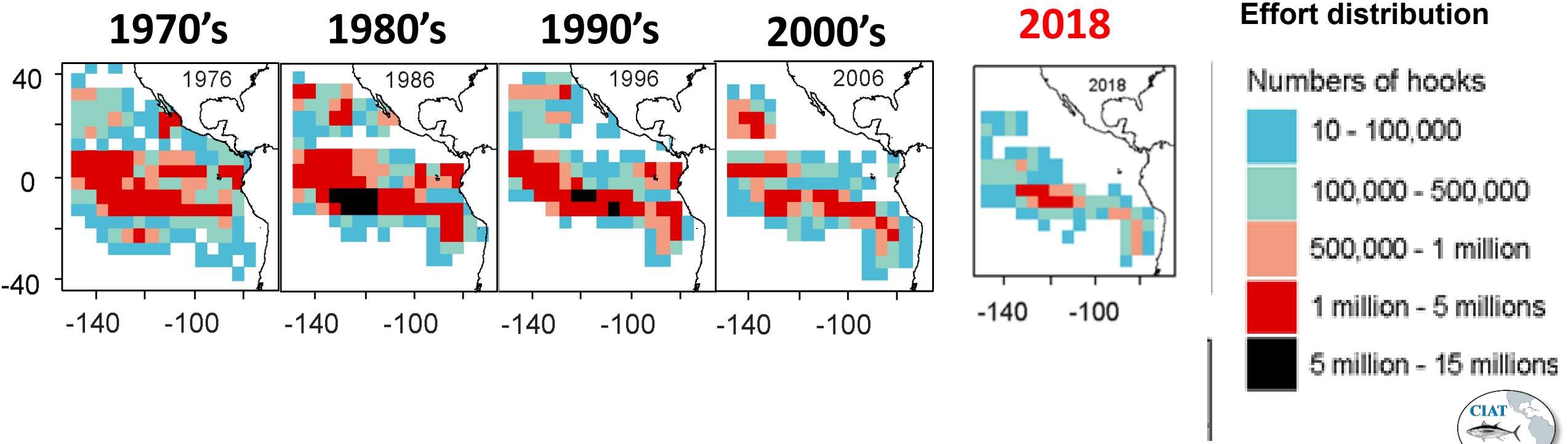


Japan
unpublished
results
WSLL-01

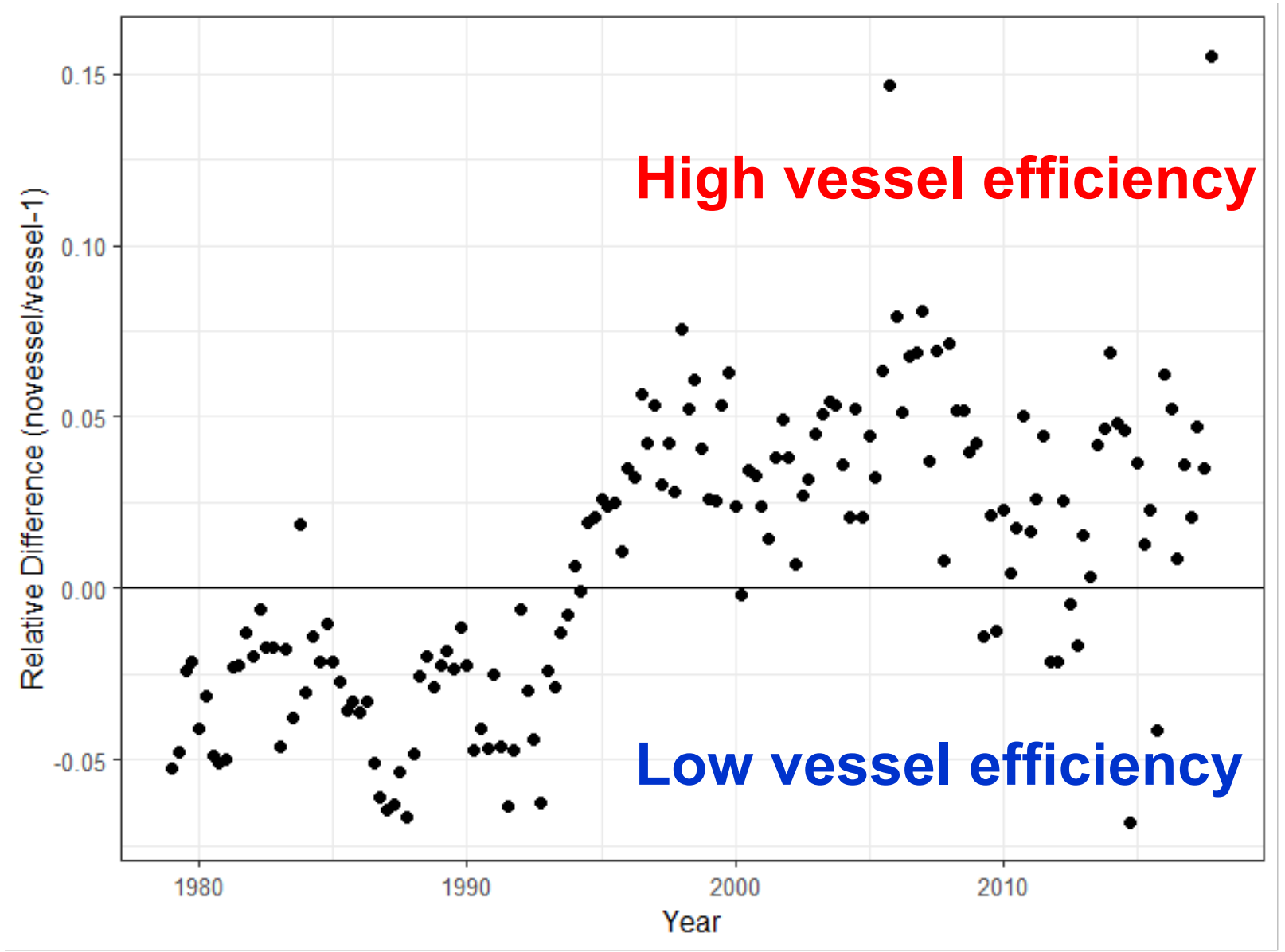
for bigeye tuna
Area 1:
150°W - 110°W
10° S – 10°N

Issues with the longline index : contraction of spatial range

The area of operation of the Japanese fleet is contracting



Issues with the longline index : temporal changes in catchability



Japan
Unpublished results
WSLL-01
for bigeye tuna

Hypotheses for index inconsistencies

- **Change in fishing behavior (e.g. targeting) by the longline fishery**
- **Mis-specified growth**
- **Inadequate consideration of spatiotemporal correlations in the indices of abundance**
- **Spatial structure in the population**

Model runs to investigate the hypotheses

- **Change in fishing behavior (e.g. targeting) by the longline fishery**

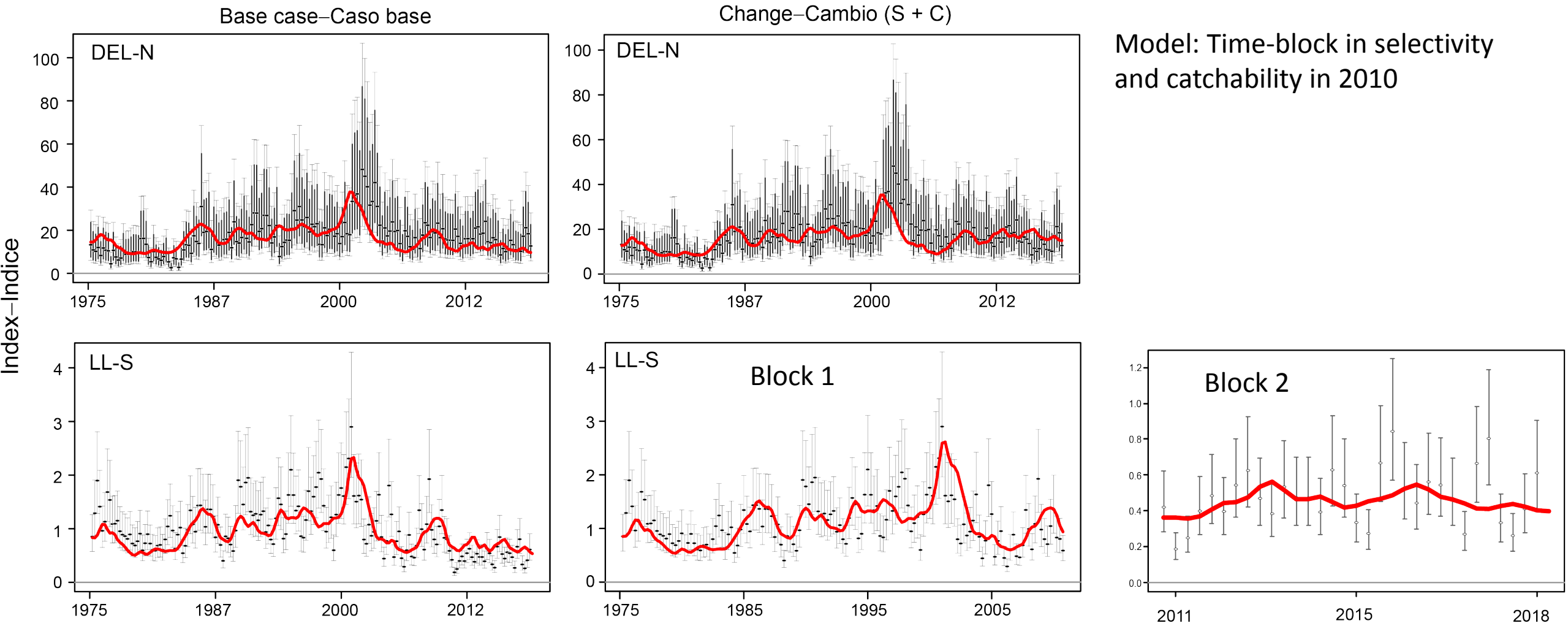
  Estimate change in selectivity and catchability in 2010

- **Mis-specified growth**

- **Inadequate consideration of spatiotemporal correlations in the indices of abundance**

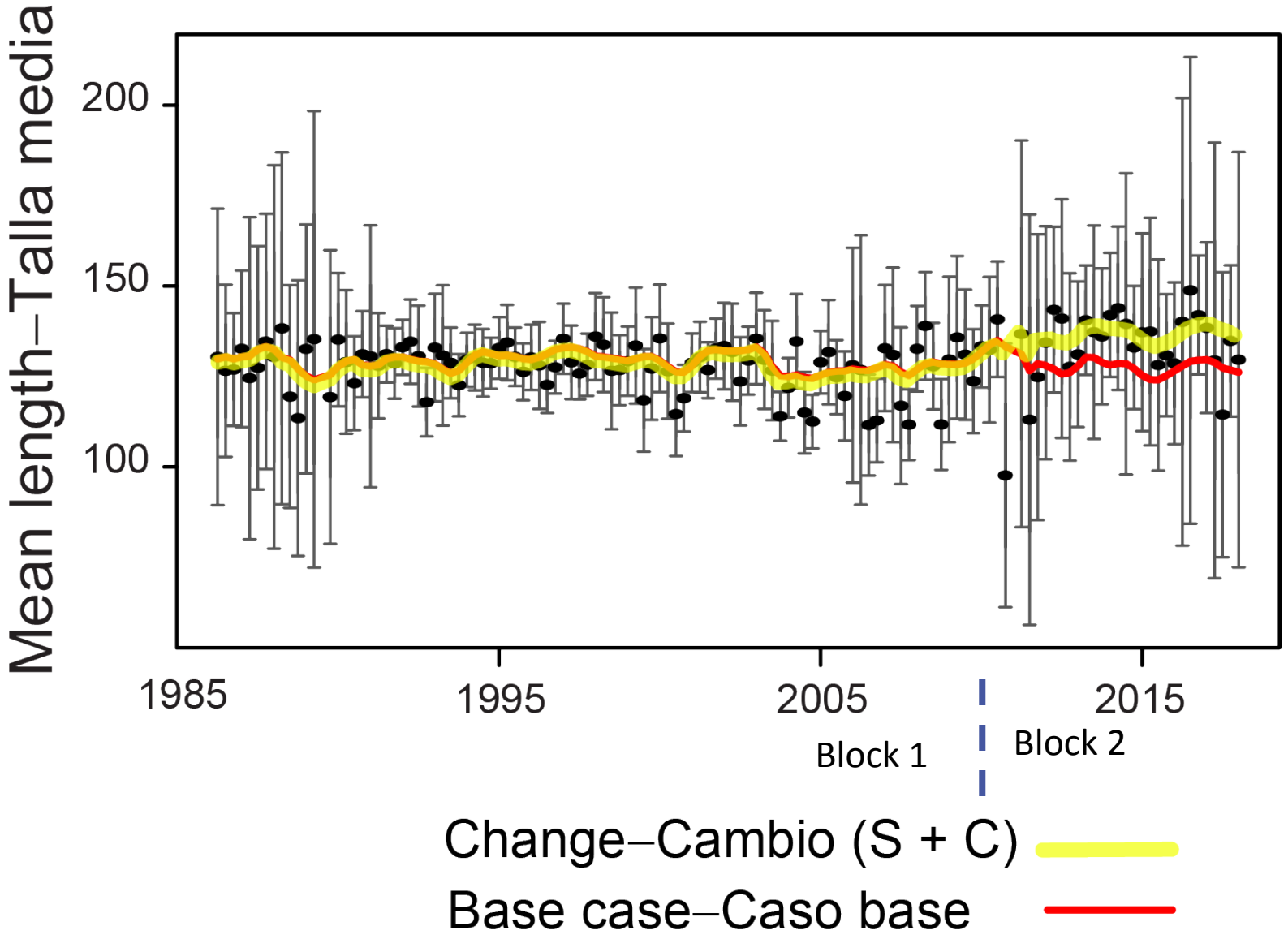
- **Spatial structure in the population**

Change in fishing behavior



Model: Time-block in selectivity and catchability in 2010

Change in fishing behavior



Model: Time-block in selectivity and catchability in 2010

Model runs to investigate the hypotheses

- **Change in fishing behavior (e.g. targeting) by the longline fishery**

  Estimate change in selectivity and catchability in 2010

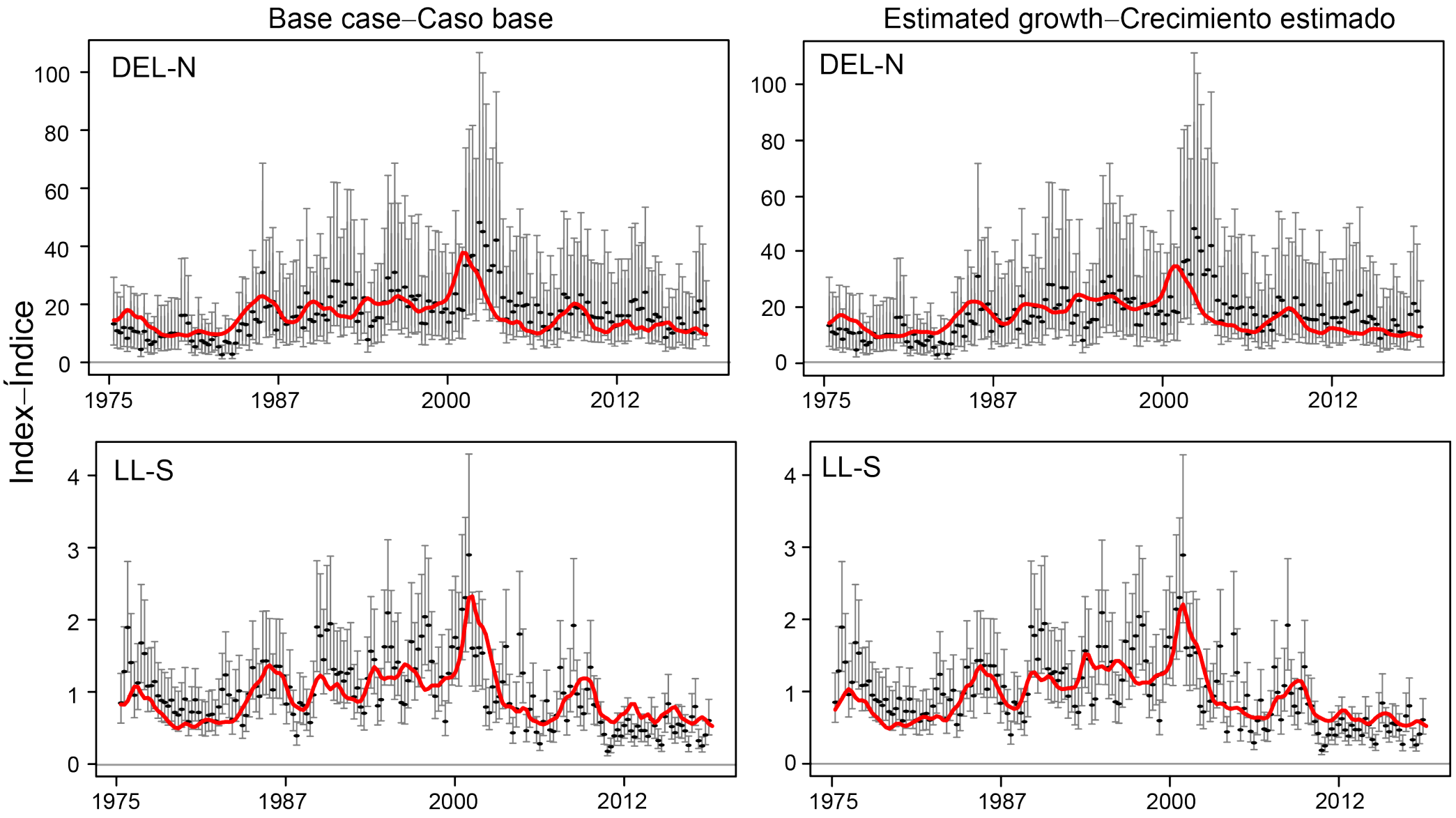
- **Mis-specified growth**

  Estimate growth parameters

- **Inadequate consideration of spatiotemporal correlations in the indices of abundance**

- **Spatial structure in the population**

Mis-specified growth



Model runs to investigate the hypotheses

- **Change in fishing behavior (e.g. targeting) by the longline fishery**

  Estimate change in selectivity and catchability in 2010

- **Mis-specified growth**

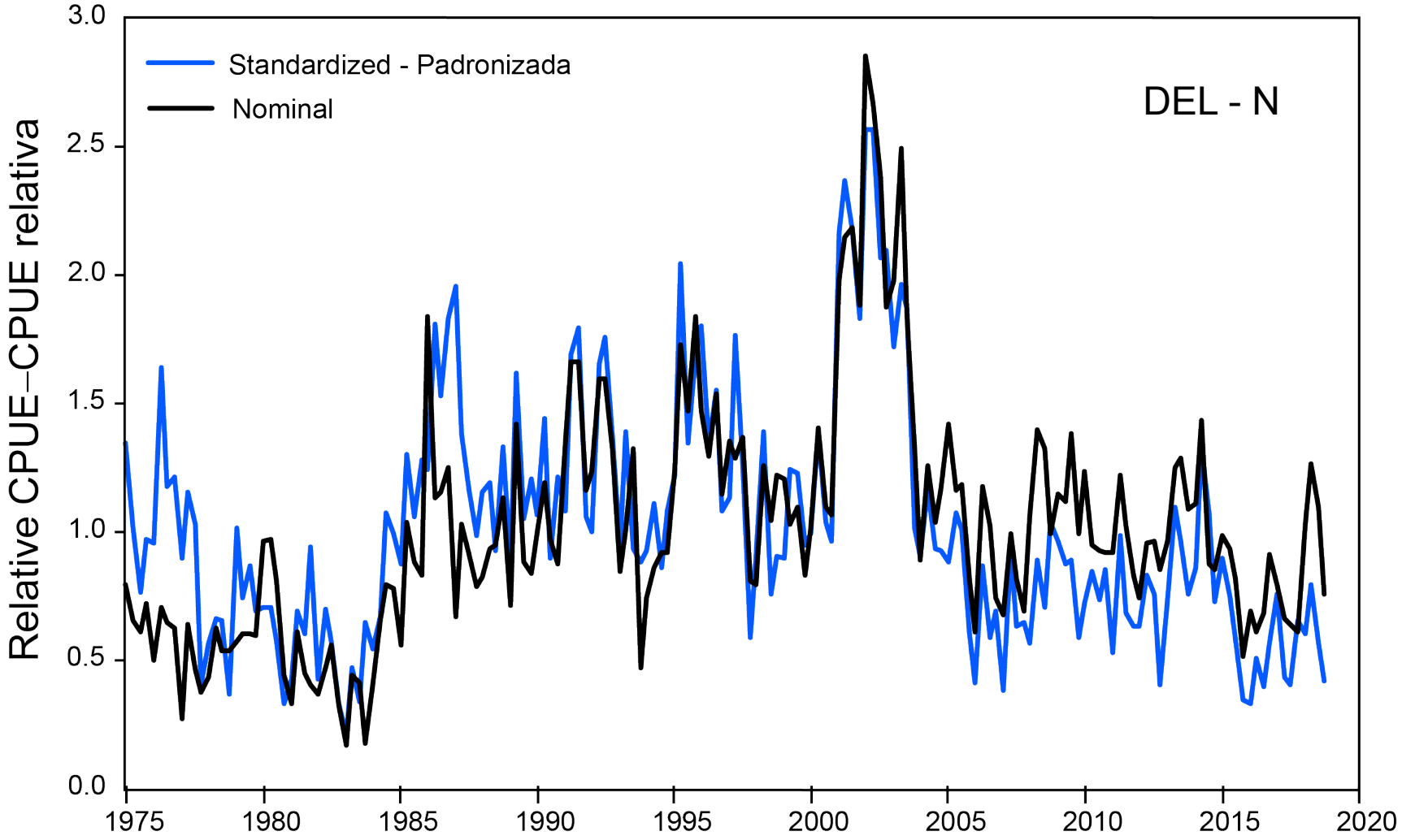
  Estimate growth parameters

- **Inadequate consideration of spatiotemporal correlations in the indices of abundance**

  Use spatiotemporal model for dolphin associated indices

- **Spatial structure in the population**

Inadequate consideration of spatial structure in the indices of abundance



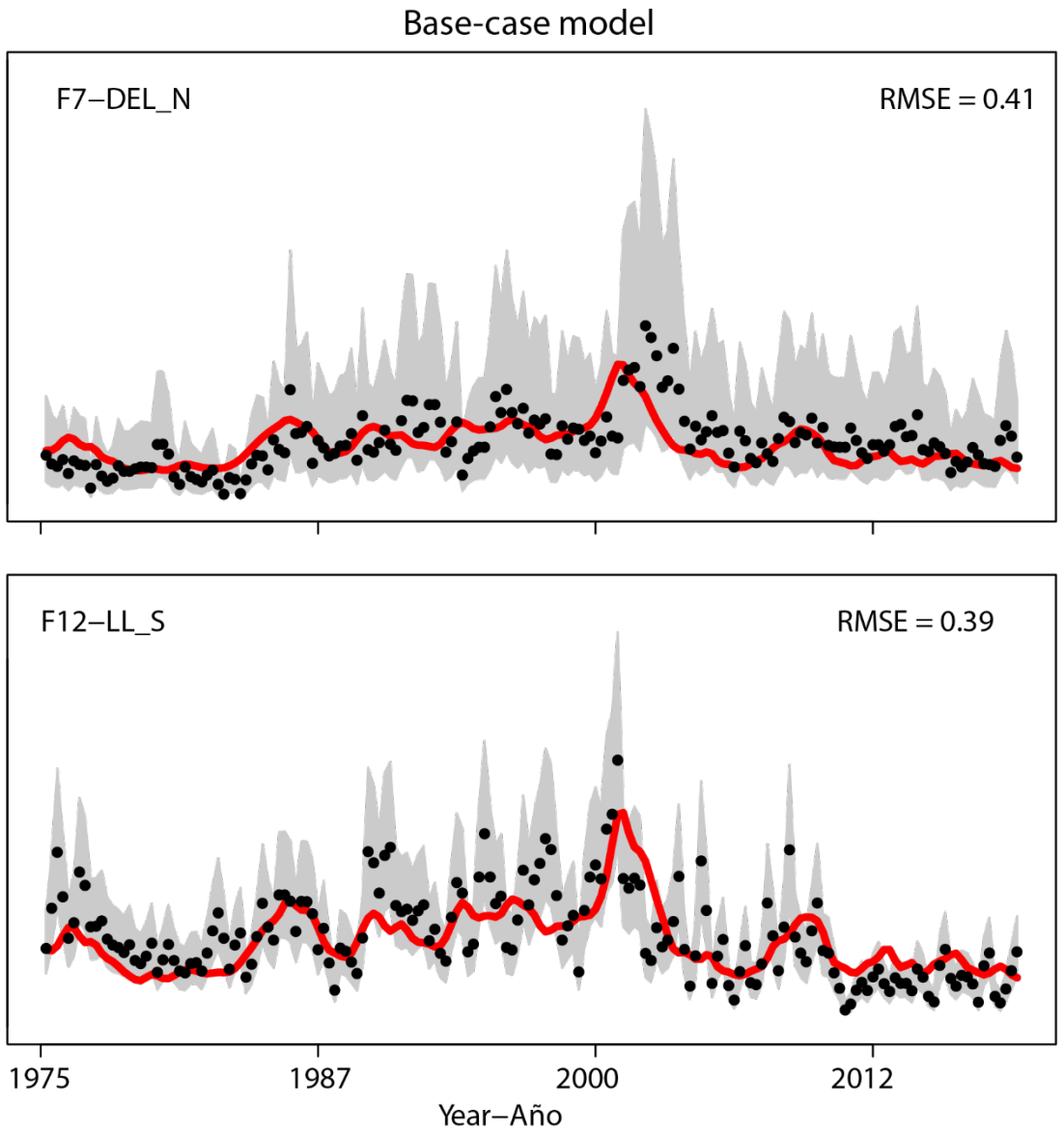
Standartization:

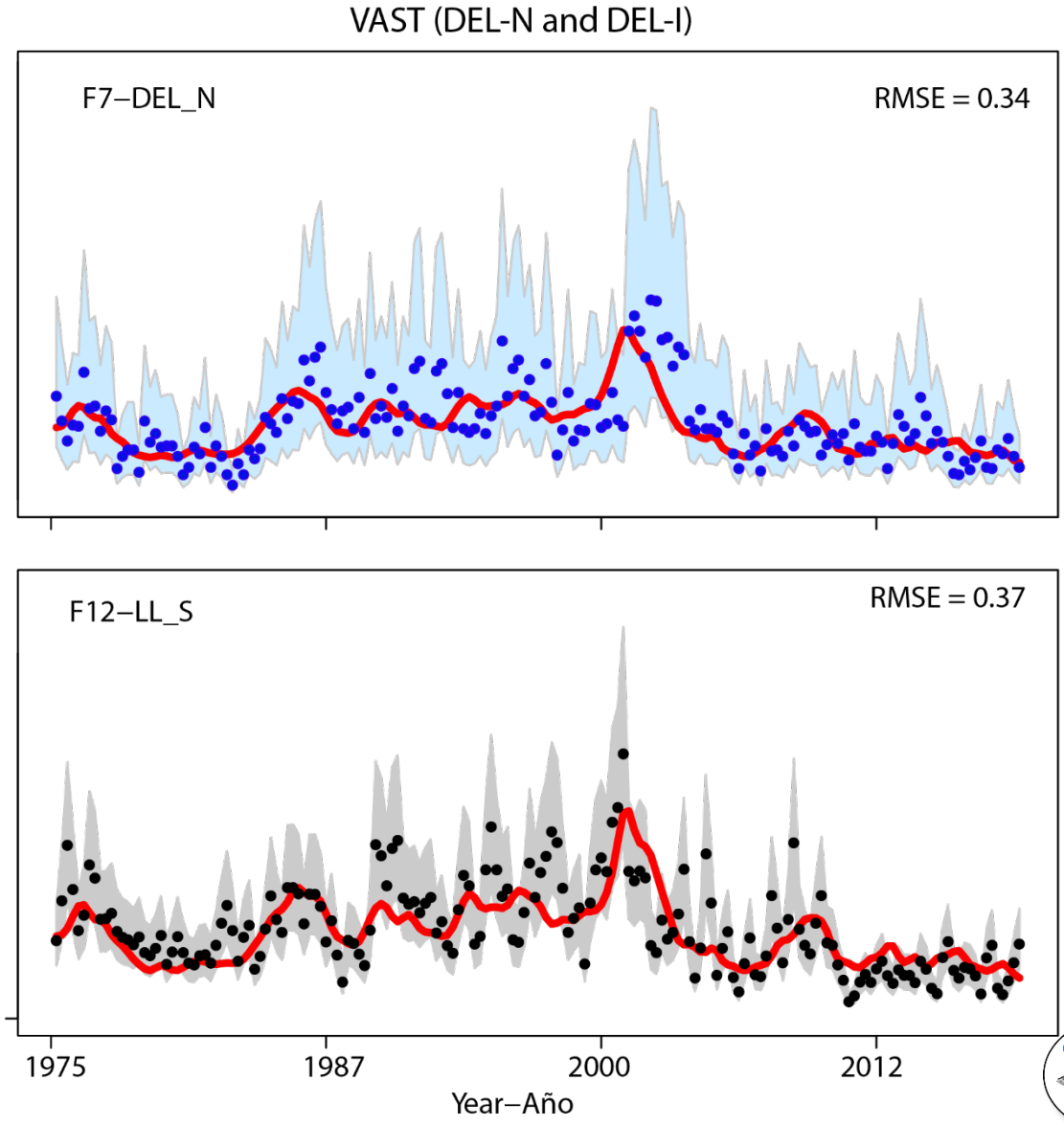
Spatiotemporal model

(Xu et al, 2019)

“VAST”

Inadequate consideration of spatial structure in the indices of abundance





Conclusions: Hypotheses for index inconsistencies

- **Change in fishing behavior (e.g. targeting) by the longline fishery**

  Does not resolve inconsistencies

- **Mis-specified growth**

  Does not resolve inconsistencies

- **Inadequate consideration of spatial structure in the indices of abundance**

  Does not fully resolve inconsistencies

- **Spatial structure in the population**

Not evaluated using that assessment model

Conclusions

- Management quantities are sensitive to the inclusion of the 2018 longline index data, as for bigeye tuna in 2018.
- Inconsistencies between longline index and the dolphin-associated purse-seine indices
- Several issues were identified with the longline-derived index of abundance over the years
- This lead to the collaborative work with longline CPCs
- Length composition changes in longline fishery:
  - used for representing catches and index
  - Contains information on mortality rates and absolute biomass (catch-curve process)
  - Should be correctly modeled (*e.g.* selectivity, growth, recruitment, and time changes)
- Four hypotheses to explain inconsistencies
- None of the evaluated hypotheses solved the inconsistencies
- **The assessment was rejected by the staff to be used as scientific basis for management advice**
- Research done to improve the assessments

Recommendation YFT-01 (October 2012)

- Stock Structure
- Fisheries Structure
- Uncertainty in Growth
- Stock-recruitment relationship
- CPUE standardization and data weighting
- Selectivity curves
- Natural mortality
- Uncertainty
- Shorten the time series

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Questions