Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission

STATUS OF YELLOWFIN TUNA IN THE EASTERN PACIFIC OCEAN IN 2017 AND OUTLOOK FOR THE FUTURE (SAC-09-06)

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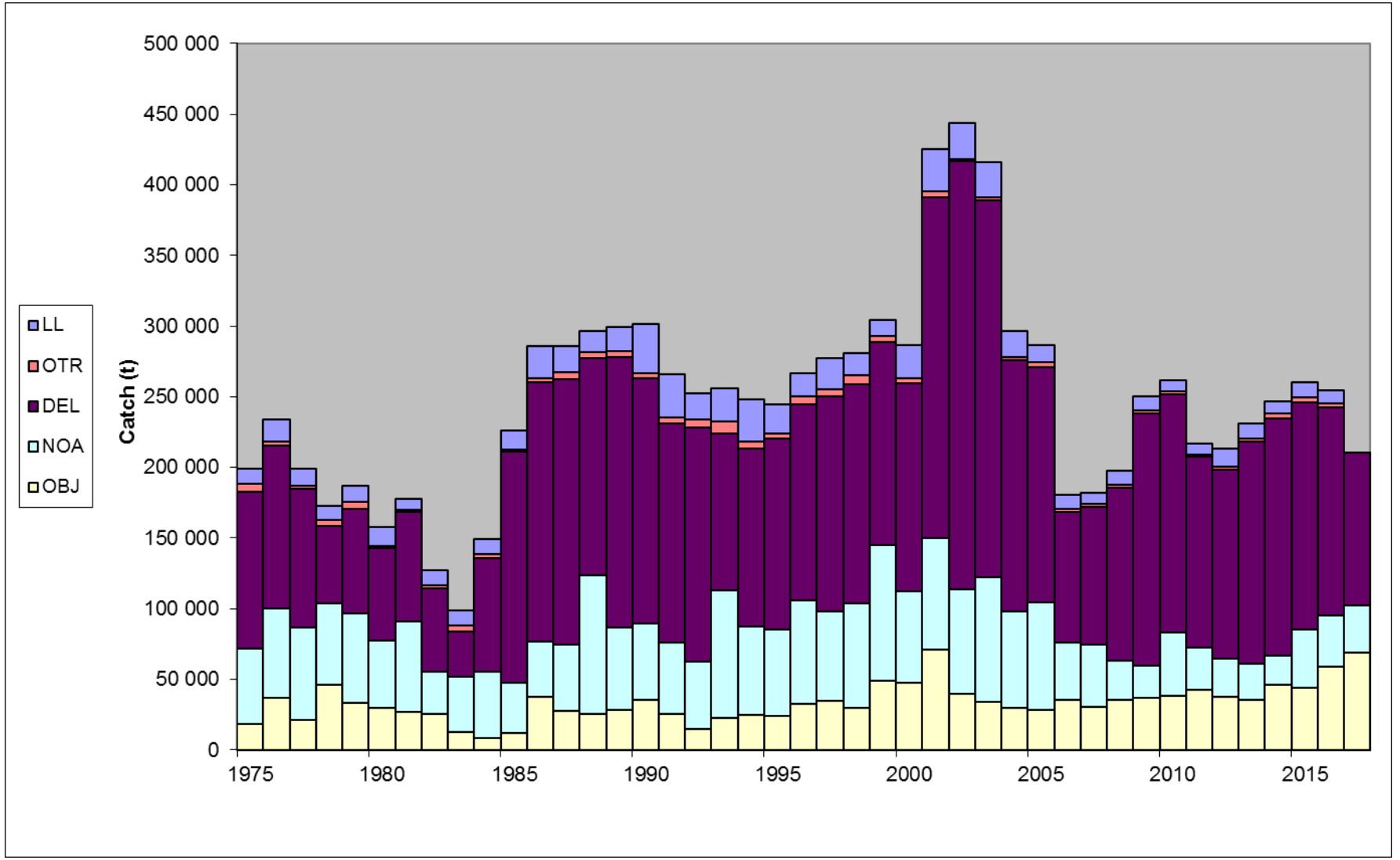
Outline

- Update stock assessment (base case model)
  - Fishery data updates
  - Model assumptions
  - Results (recruitment, biomass and fishing mortality)
  - Stock status (Kobe plots and management quantities)
- Sensitivity analysis
  - Stock-recruitment relationship (steepness, $h = 0.75$)
- Summary conclusions
- Future directions

Fishery data updates

- Surface fisheries
  - Catch, CPUE and size-frequency data updated to include new data for 2017 and revised data for 2016
- Longline fisheries
  - New or updated longline catch data were available for China (2016), Japan (2015-2017), Korea (2016), Chinese Taipei (2014-2016), the United States (2015-2016), French Polynesia (2016), Vanuatu (2016), and other nations (2010-2016)
  - The longline catch data available for 2017 is from monthly reports (Japan)
  - New or updated CPUE data available for Japan (2016-2017)
  - New or updated commercial size-frequency data for Japan (2014-2015)

Total catches



Model assumptions

- Update assessment: the 2017 assessment uses the same model as in SAC8:
  - **Stock structure:** One stock is assumed for the whole EPO
  - **Fishery definitions**: 16 fisheries + 2 surveys
  - **Growth**: Richards curve with fixed parameters
  - **Natural mortality:** sex-specific
  - **Stock-recruitment function:** Beverton-Holt function with steepness h=1.0 (base-case model) and h=0.75 (sensitivity)
  - **Catchability**: catchability coefficients for 5 CPUE time series are estimated (NOA-N, NOA-S, DEL-N, DOL-E, LL-S)
  - **Selectivity**: Selectivity curves for 11 of the 16 fisheries are estimated (F9 DEL-S mirrors F12 LL-S) and for the 2 longline "surveys" , logistic selectivity for LL-S and DEL-S, and dome-shaped for other fisheries (except discards) and "surveys"
  - **Data-weighting**: LL-S is the main index of abundance (CV=0.2), extra variability estimated for the other 4 indices, length-composition data with λ=1

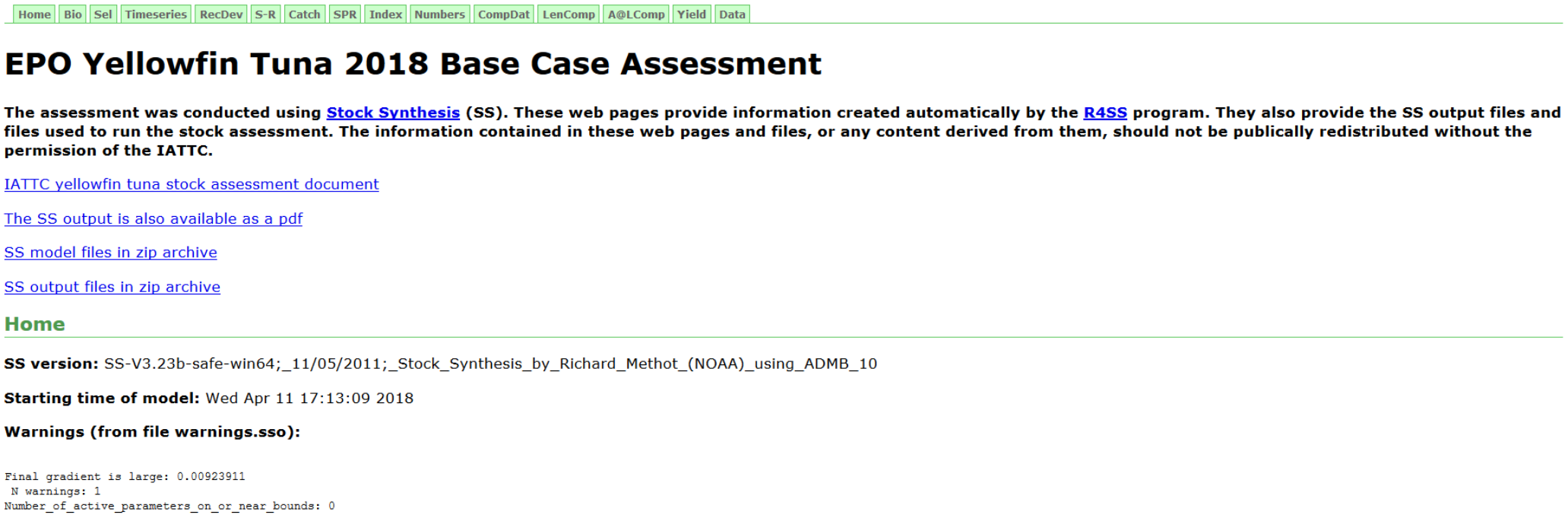
SS output report

- Available at

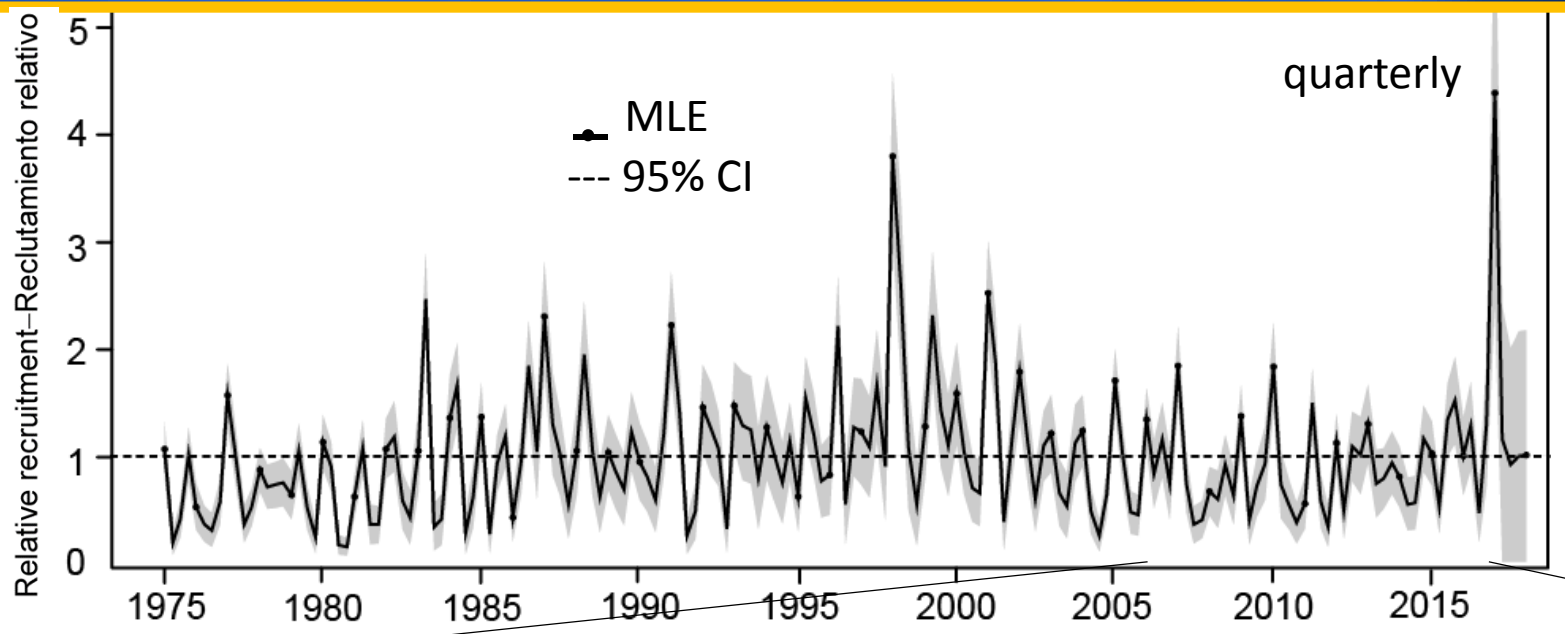
http://www.iattc.org/Meetings/Meetings2018/SAC-09/9thMeetingScientificAdvisoryCommitteeENG.htm

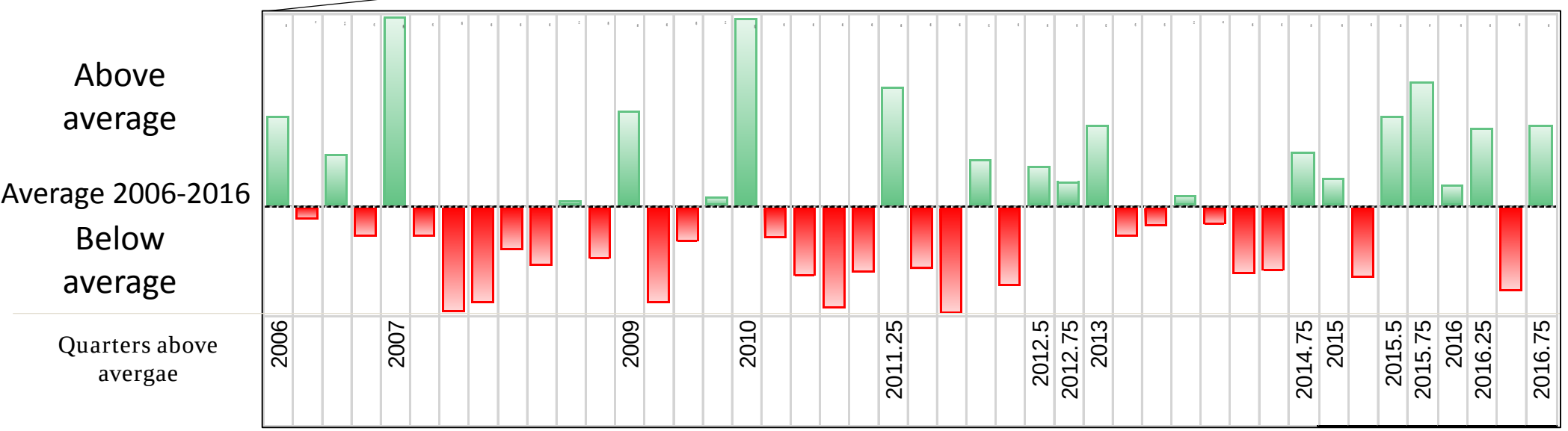
Supplemental materials

Yellowfin tuna

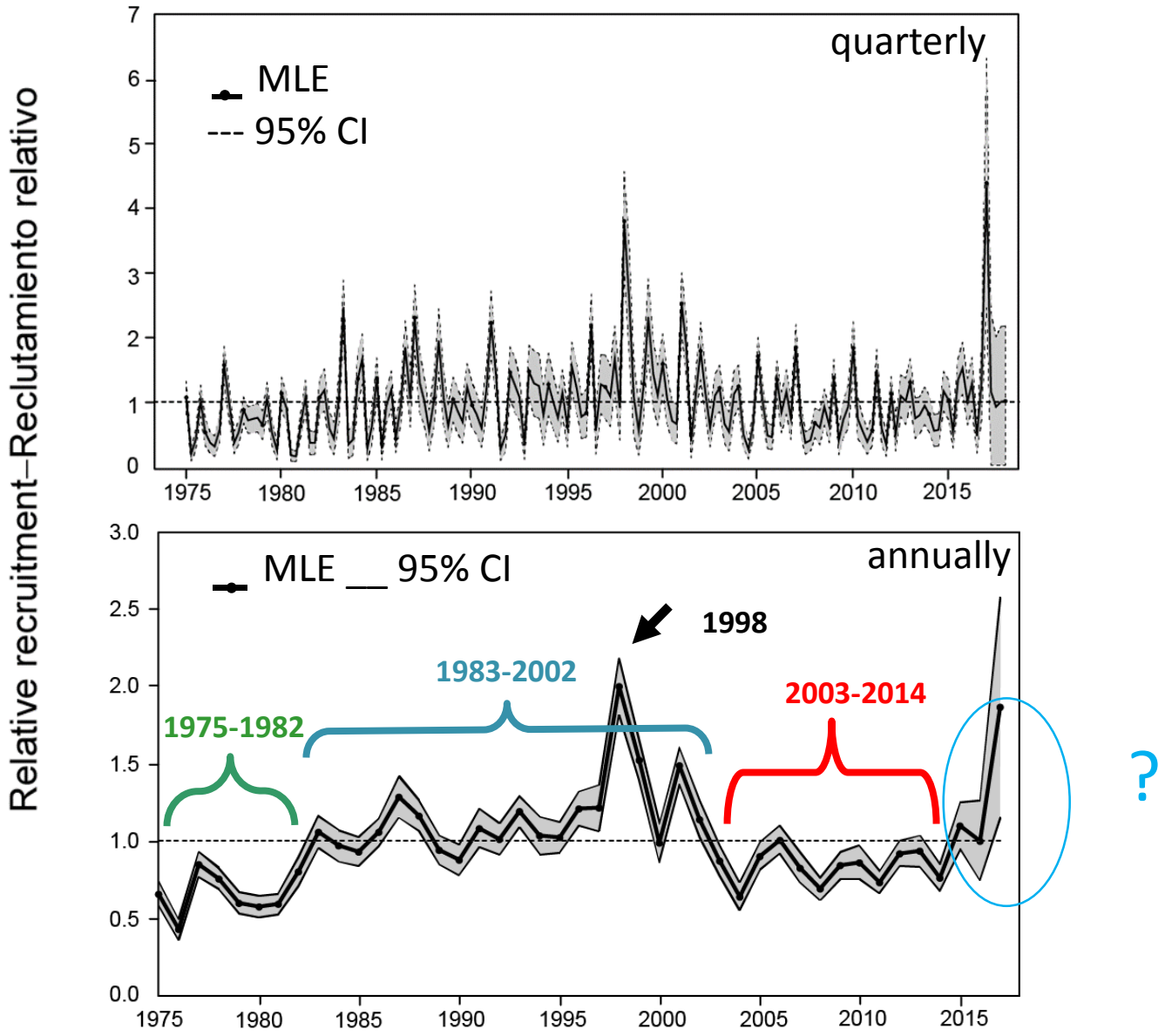


Recruitment



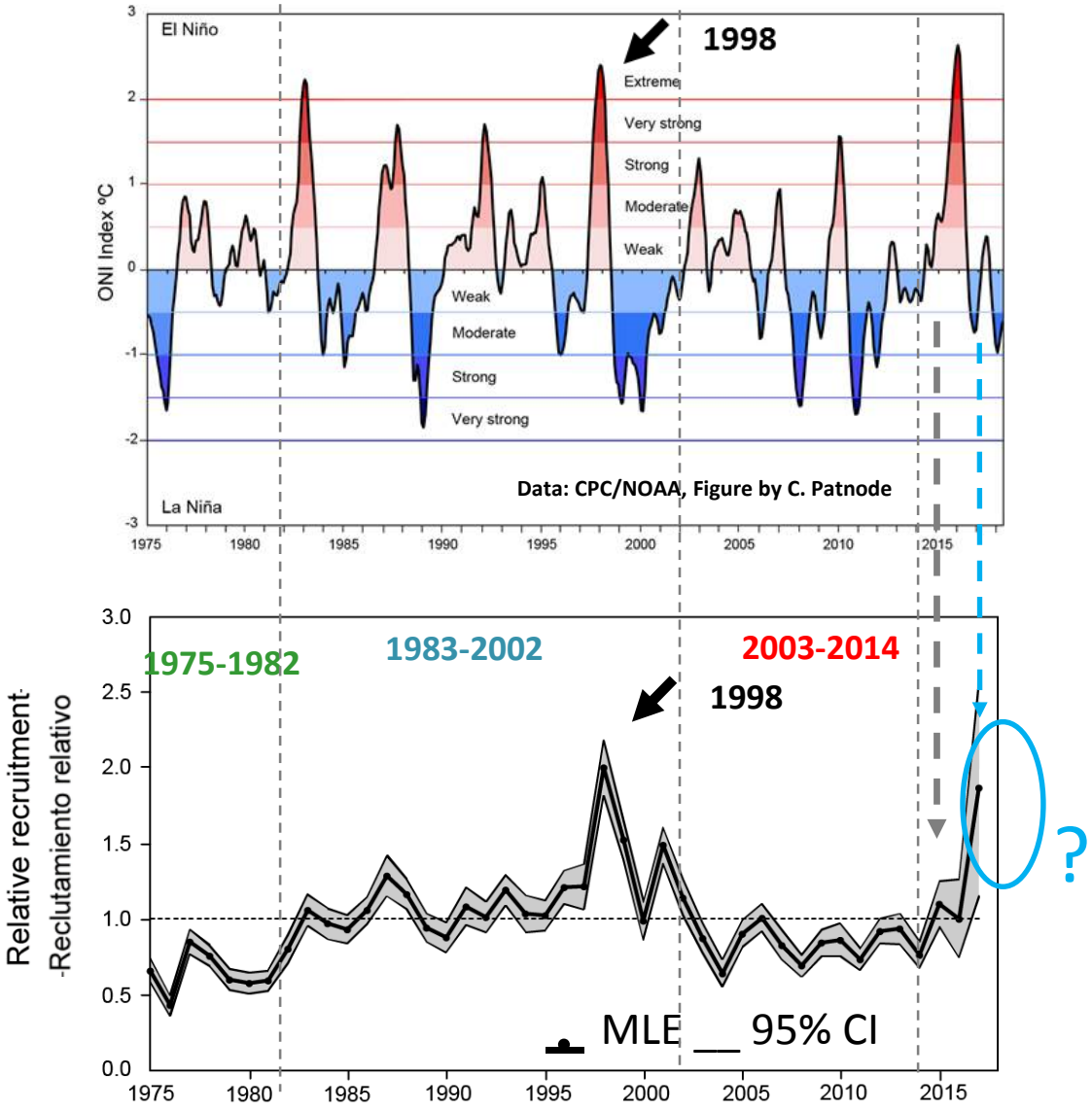


Recruitment

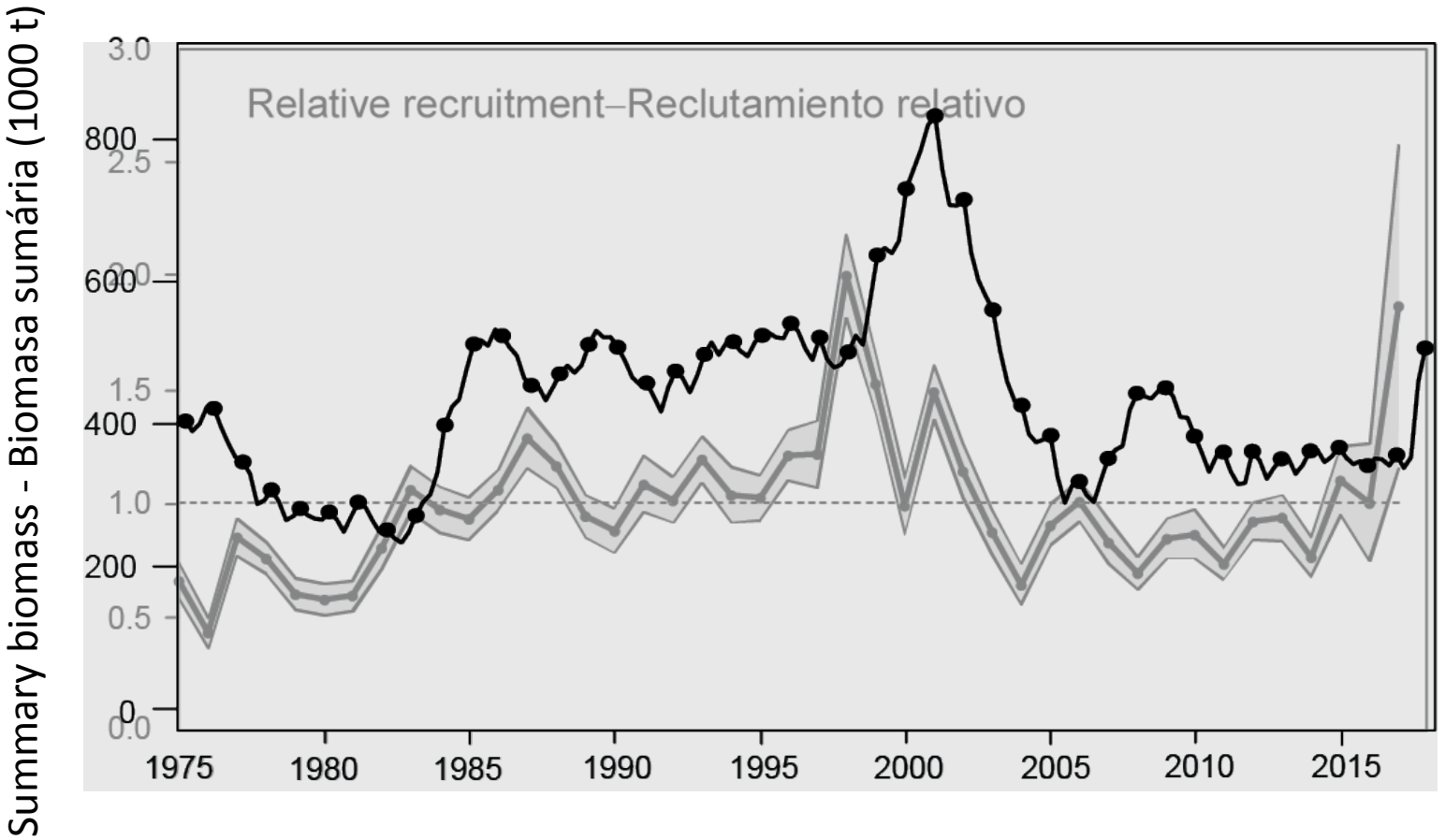


Recruitment – environmental effects

Oceanic Niño Index
(5°N-5°S, 170°W-120°W)

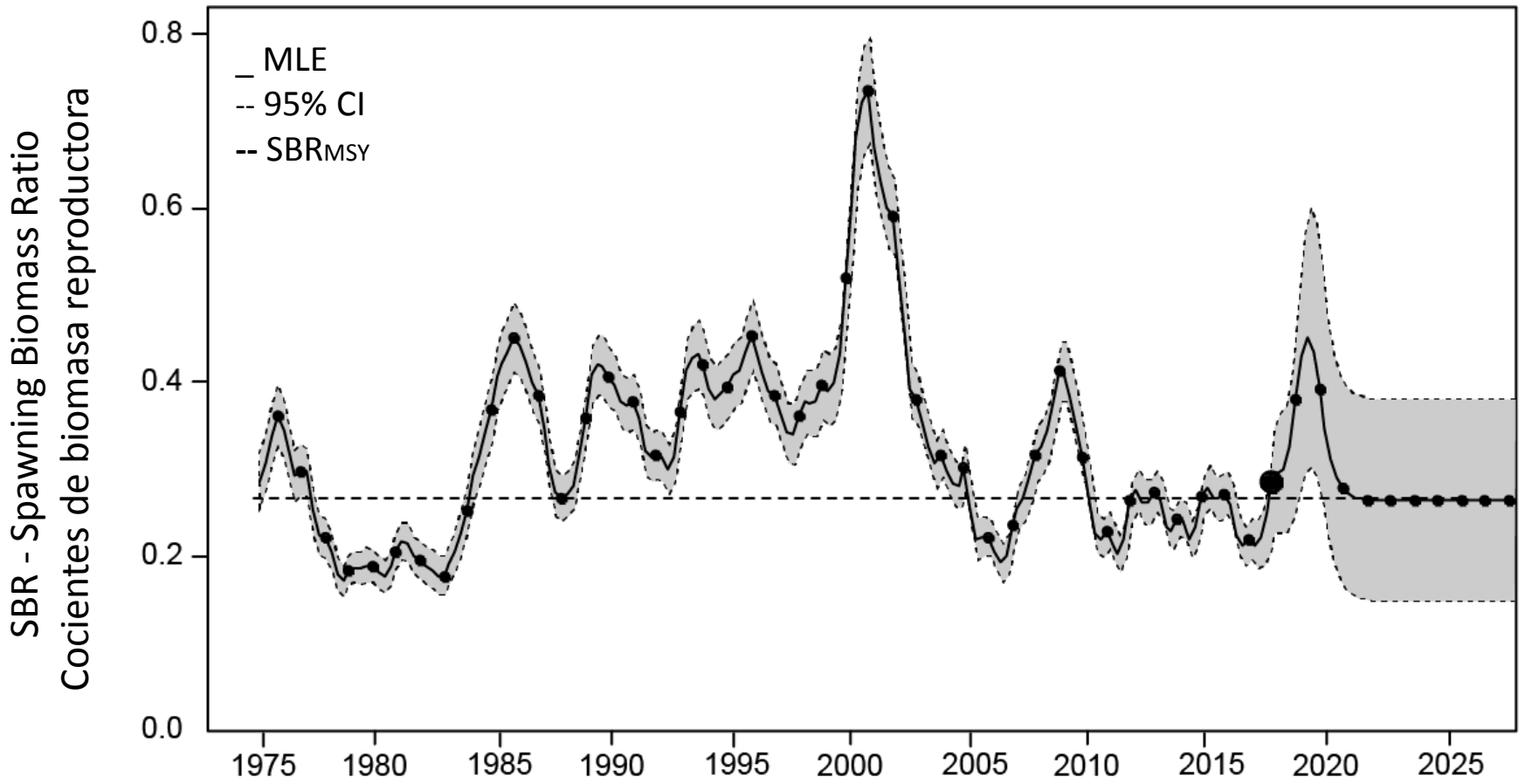


Summary biomass



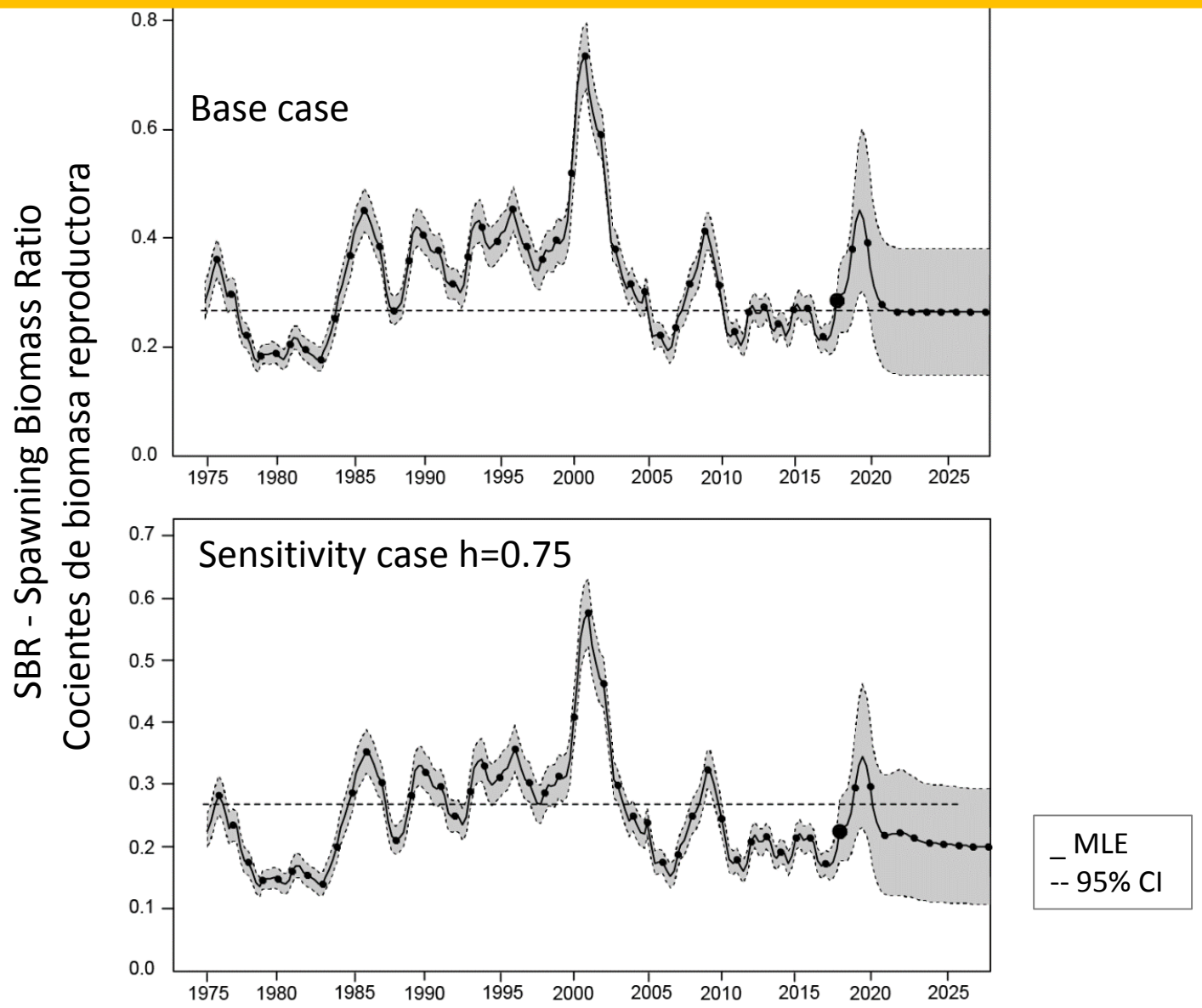
Biomass of fish 0.75 years-old and older

Spawning biomass

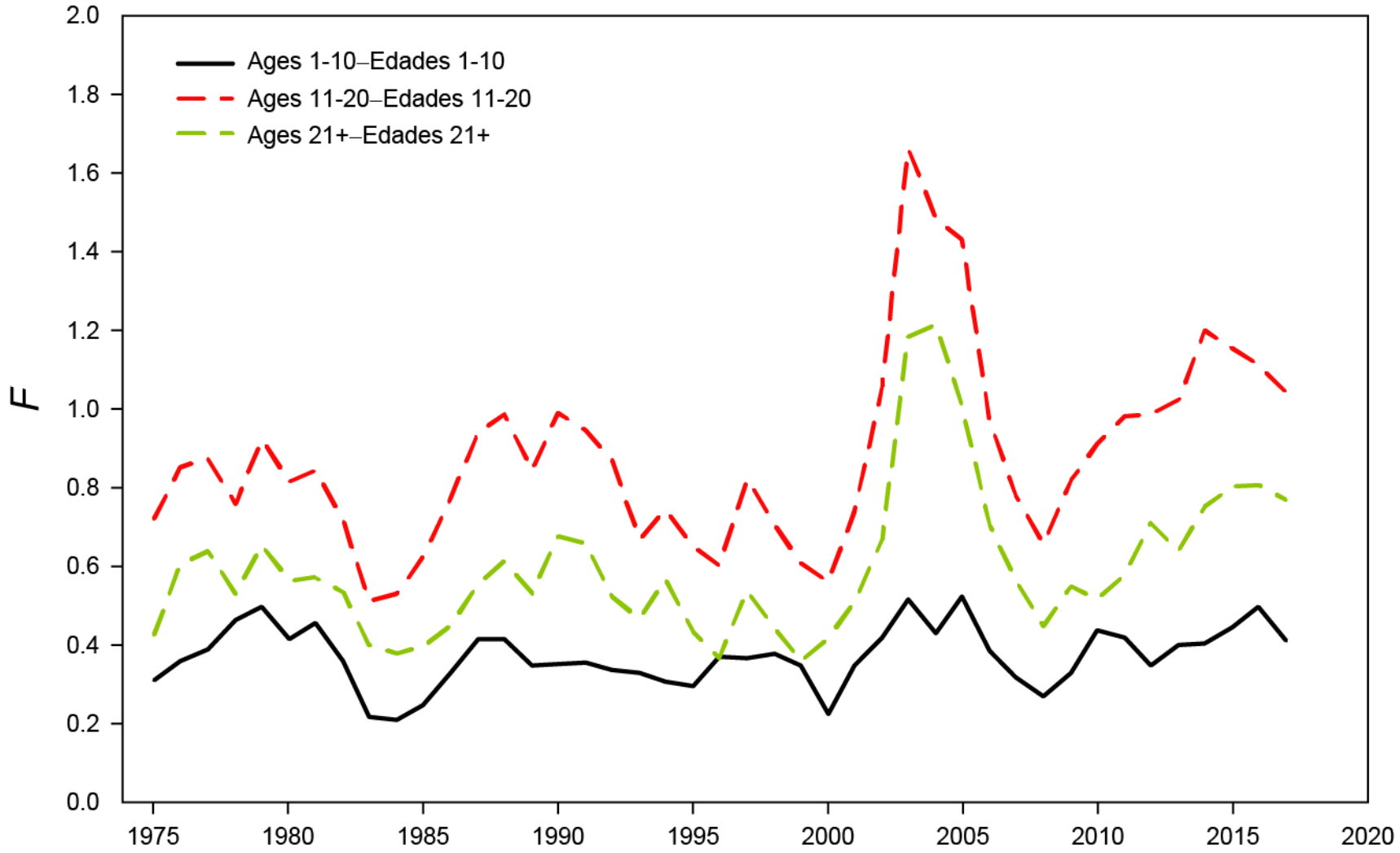


Spawning biomass ratio (SBR; is the ratio of the current spawning biomass to that of the unfished population)

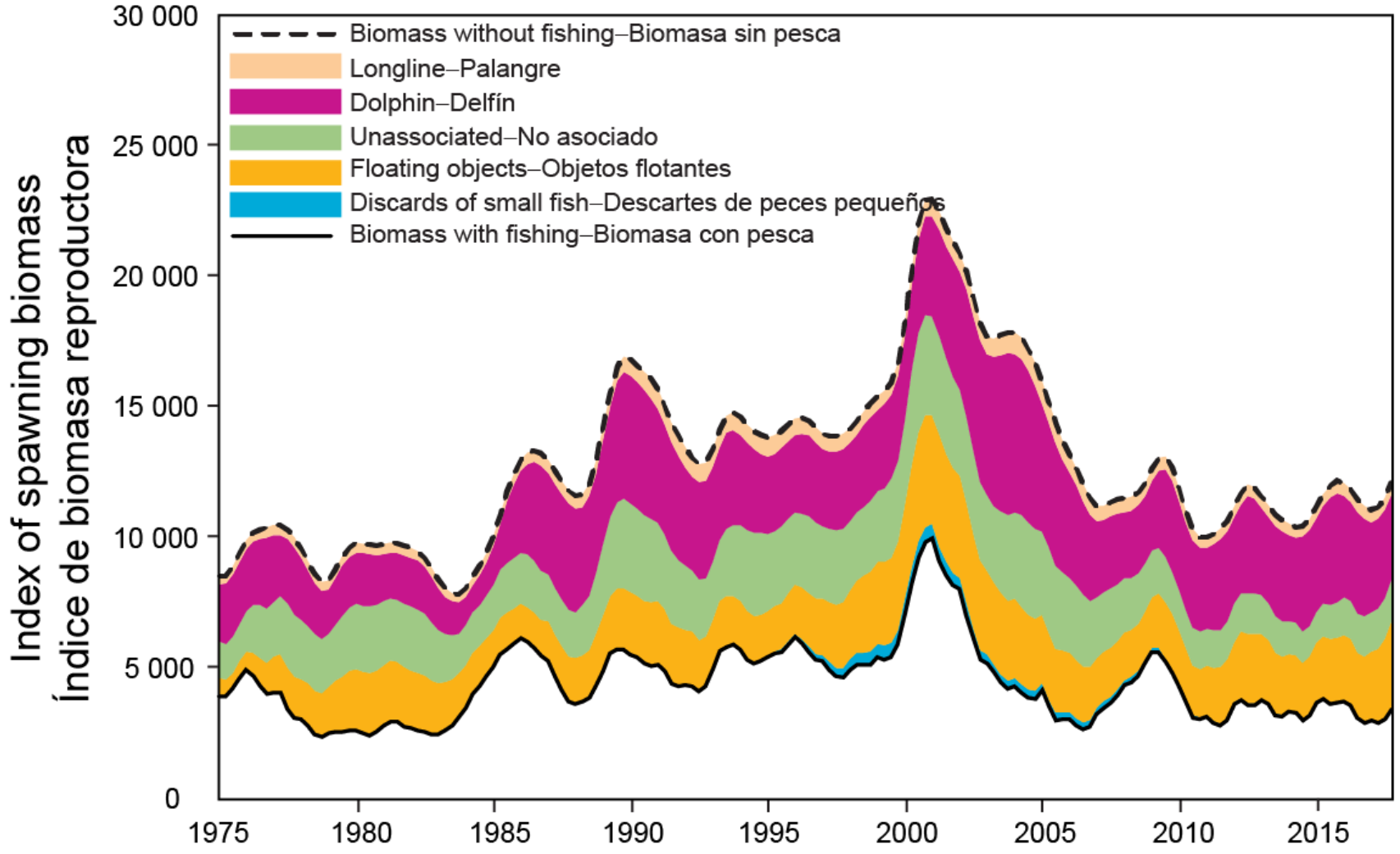
Spawning biomass



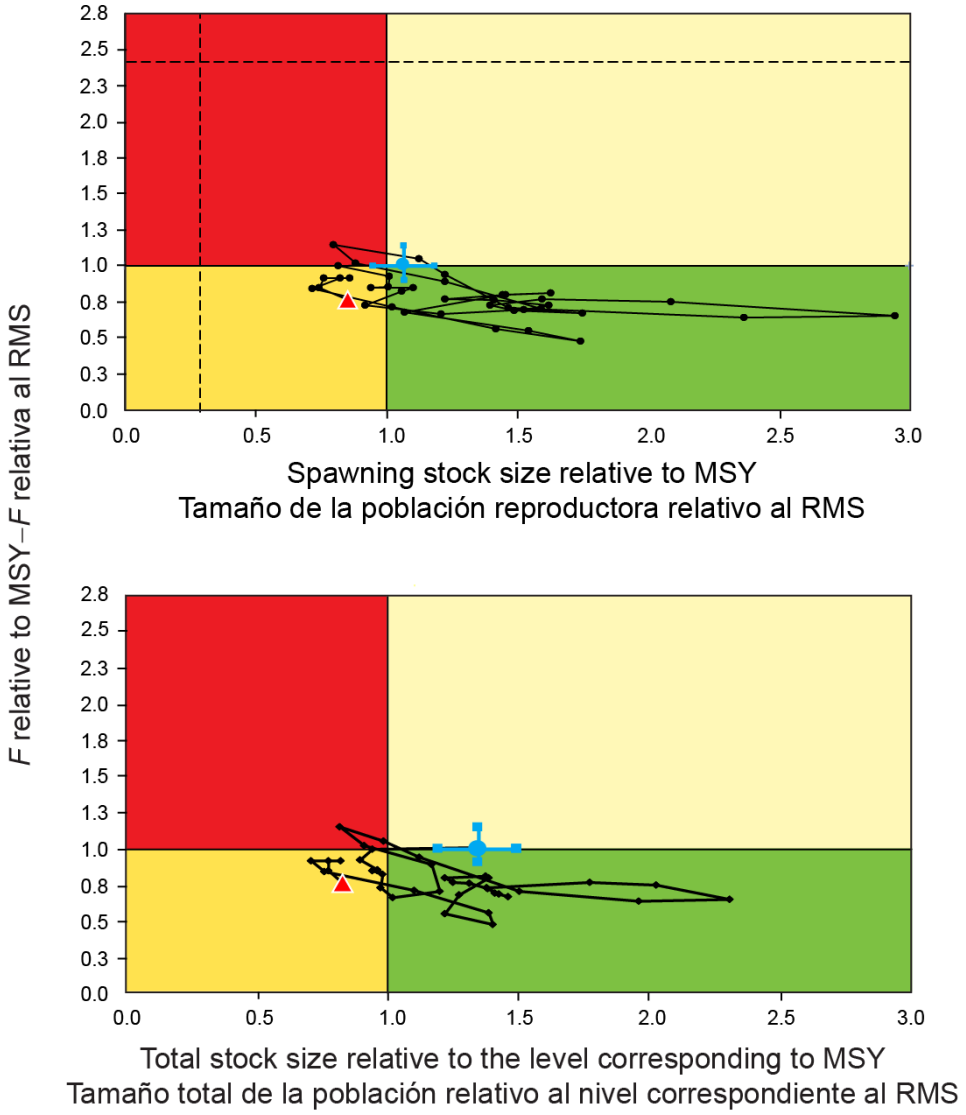
Fishing mortality



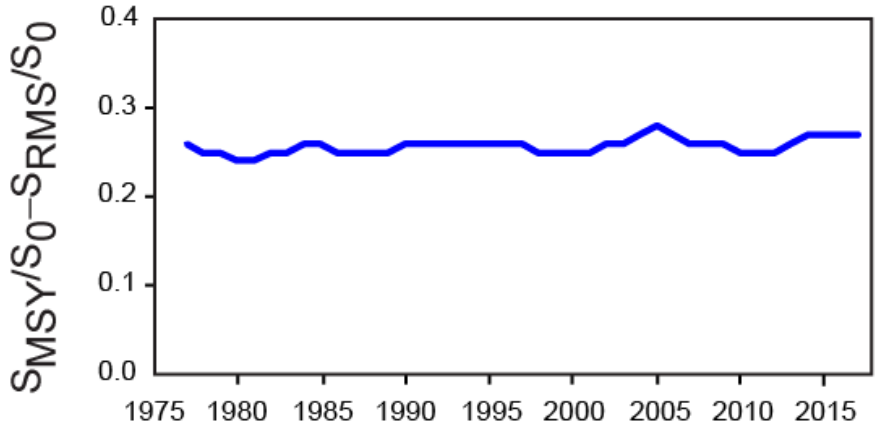
Fisheries impact

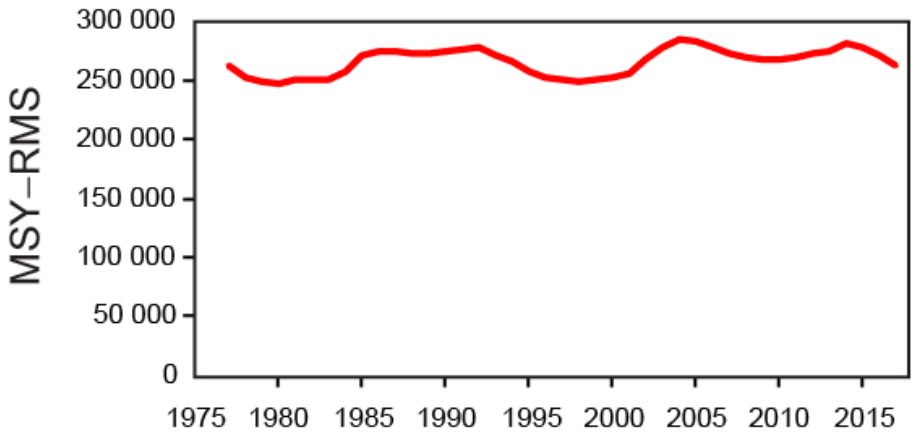


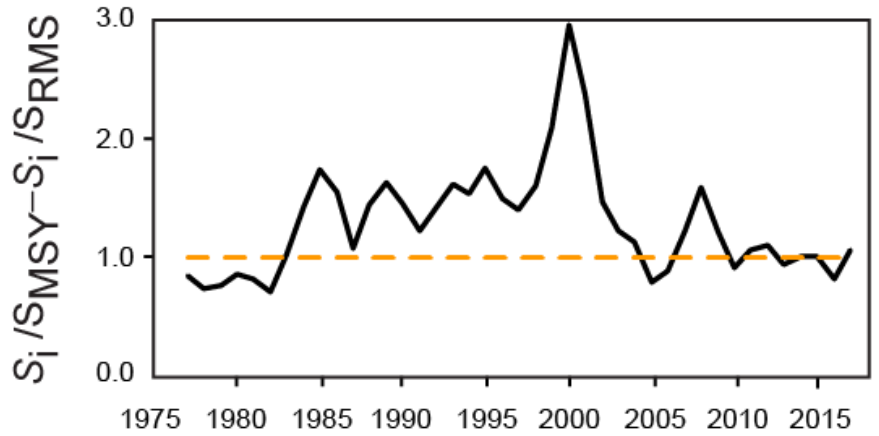
Kobe plots

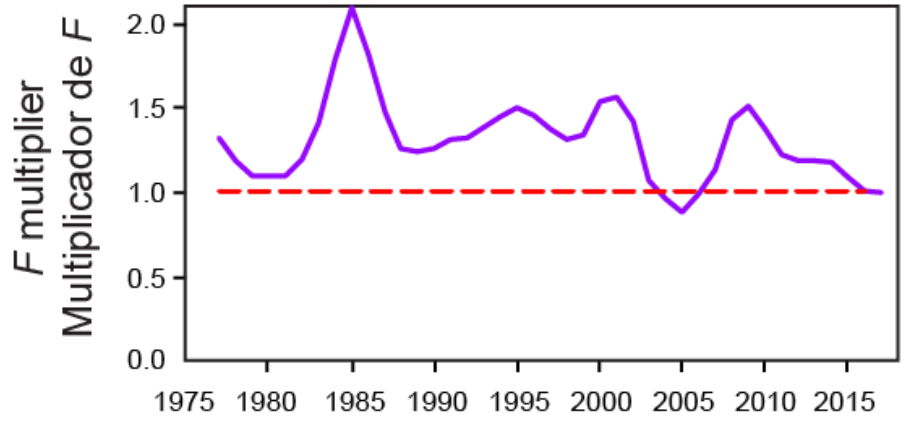

2.8
2.5
2.3
2.0
1.8
1.5
1.3
1.0
0.8
0.5
0.3
0.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
F relative to MSY–F relativa al RMS
Spawning stock size relative to MSY
Tamaño de la población reproductora relativo al RMS
Total stock size relative to the level corresponding to MSY
Tamaño total de la población relativo al nivel correspondiente al RMS

Time-varying indicators

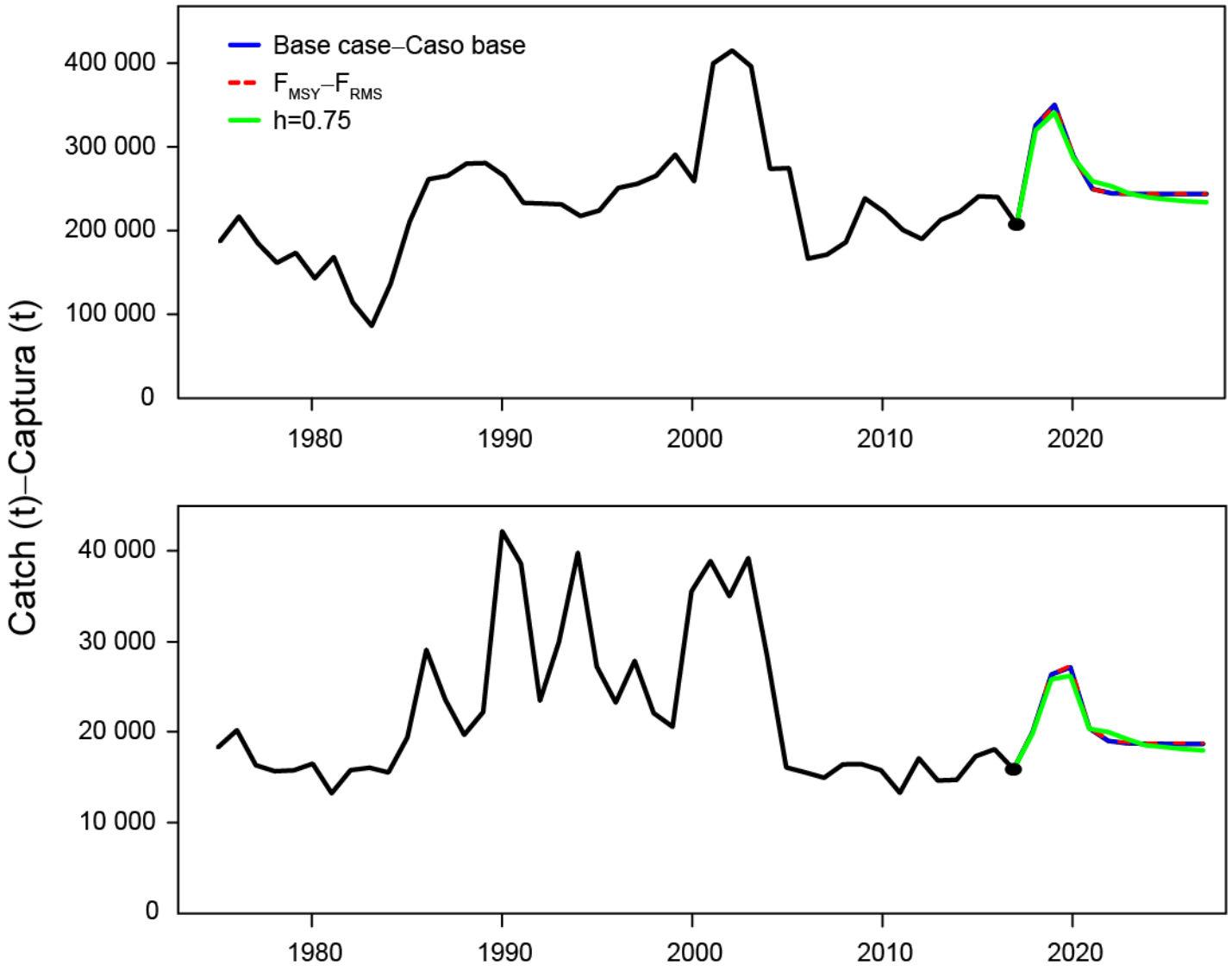








Projected catches



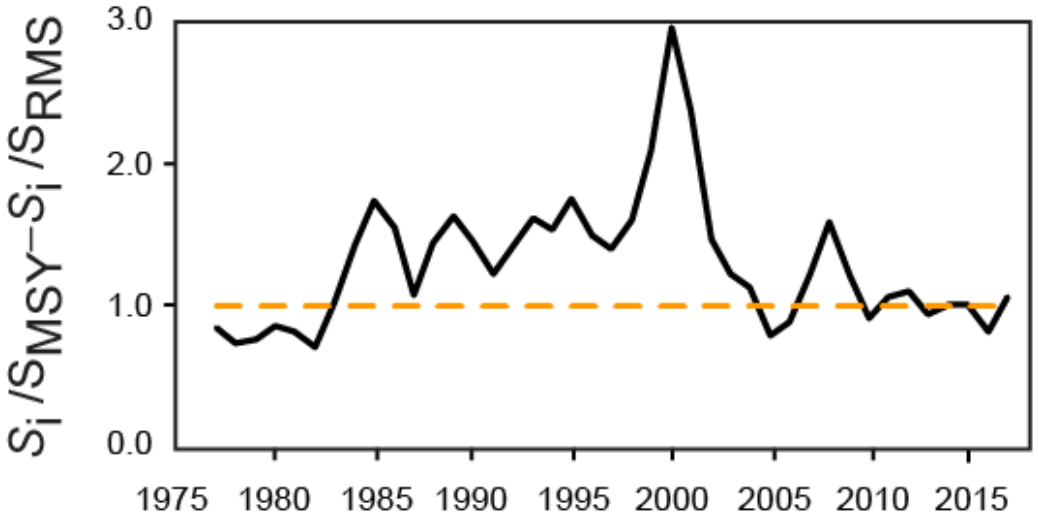
MSY and related quantities

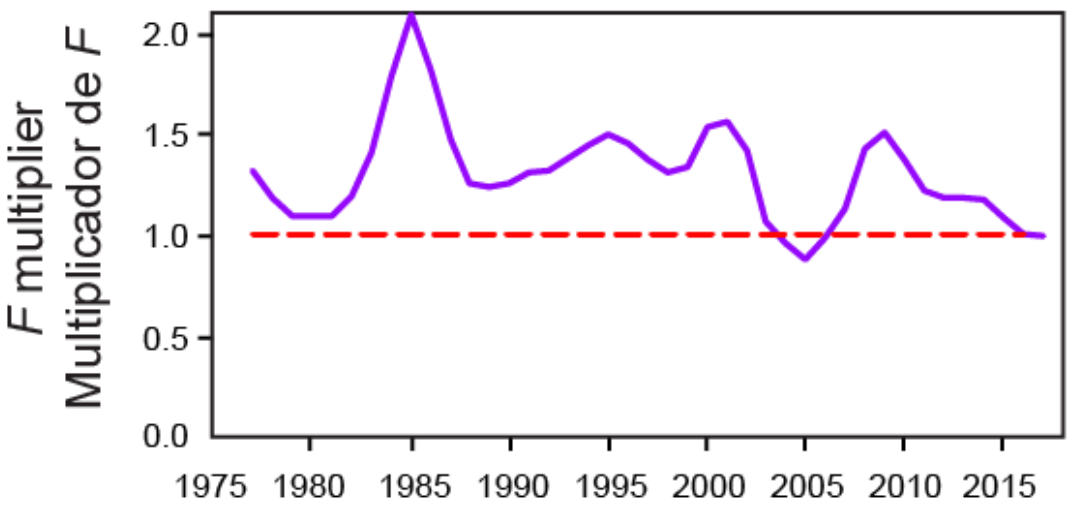
YFT	Base case Caso base	*h* = 0.75
MSY-RMS	264,283	278,584
B_{MSY}- B_{RMS}	376,696	560,713
S_{MSY}- S_{RMS}	3,634	6,080
B_{MSY}/B_0- B_{RMS}/B_0	0.31	0.37
S_{MSY}/S_0- S_{RMS}/S_0	0.27	0.35
C_{recent}/MSY- $C_{reciente}$/RMS	0.85	0.81
B_{recent}/B_{MSY}- $B_{reciente}/B_{RMS}$	1.35	0.89
S_{recent}/S_{MSY}-$S_{reciente}/S_{RMS}$	1.08	0.64
F multiplier-Multiplicador de *F*	0.99	0.64

Summary: key results

- The recent levels of spawning biomass are estimated to be slightly **above** those corresponding to the MSY
- $S_{recent} > S_{MSY}$

- The recent fishing mortality rates are estimated to be slightly **above** those corresponding to the MSY, so Fmultiplier < 1
- $F_{recent} > F_{MSY}$





Summary: key results

Based on the current and previous assessments, those interpretations are highly sensitive to the following assumptions:

- **Steepness** of stock-recruitment relationship
- **Growth** (average size of the oldest fish, L2)
- **Natural mortality** levels
- Data-weighting:
  - Weighting assigned to the indices of relative abundance
  - Weighting assigned to the size composition data

Summary: key results

- Results are more **pessimistic** with:
  - The inclusion of a stock-recruitment relationship
  - Higher values of the average size of the oldest fish (L_2 > 182 cm)
  - Lower rates of adult natural mortality (M)
  - Reweigthing of the size-composition data

- Results are more **optimistic** with:
  - Lower values of the average size of the oldest fish (L_2 < 182 cm)
  - Higher rates of adult natural mortality (M)
  - Fitting to CPUE DEL-N as main index of abundance (S_{recent}>S_{MSY})

Future directions:

Priorities in future research for improving the yellowfin stock assessment

- Analysis of changes in spatial distribution of effort for the **southern longline fishery**, and potential changes in targeting
- Explore the use of an **monthly time step** model
- Implementation of a **large-scale tagging** program to address hypotheses about stock structure and regional differences in life-history parameters and depletion.
- **Improved estimates of growth**, particularly for older fish.
- Exploration of different assumptions in the model: **weighting of the different data sets**, refinement of **fisheries definitions, time-variant selectivity** (mainly OBJ), alternative assumptions about **stock structure**.

Questions