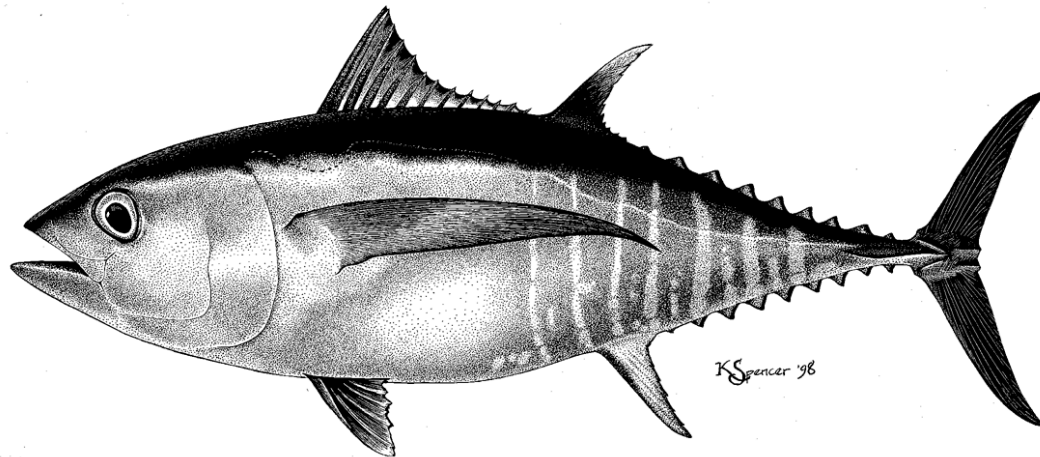


STATUS OF BIGEYE TUNA IN THE EASTERN PACIFIC OCEAN IN 2013

January 1975 – December 2013



Outline



- Update stock assessment (base case model)
 - § Fishery data updates
 - § Model assumptions
 - § Results (fishing mortality, recruitment, biomasses)
 - § Stock status (base case)
 - § Population projections (*status quo* and F_{MSY})
- Stock-recruitment sensitivity analysis
(steepness = 0.75)
- Summary conclusions





New or updated data

- Surface fisheries

- § Catch, CPUE and size-frequency data updated to include new data for 2013 and revised data for earlier years

- Longline fisheries

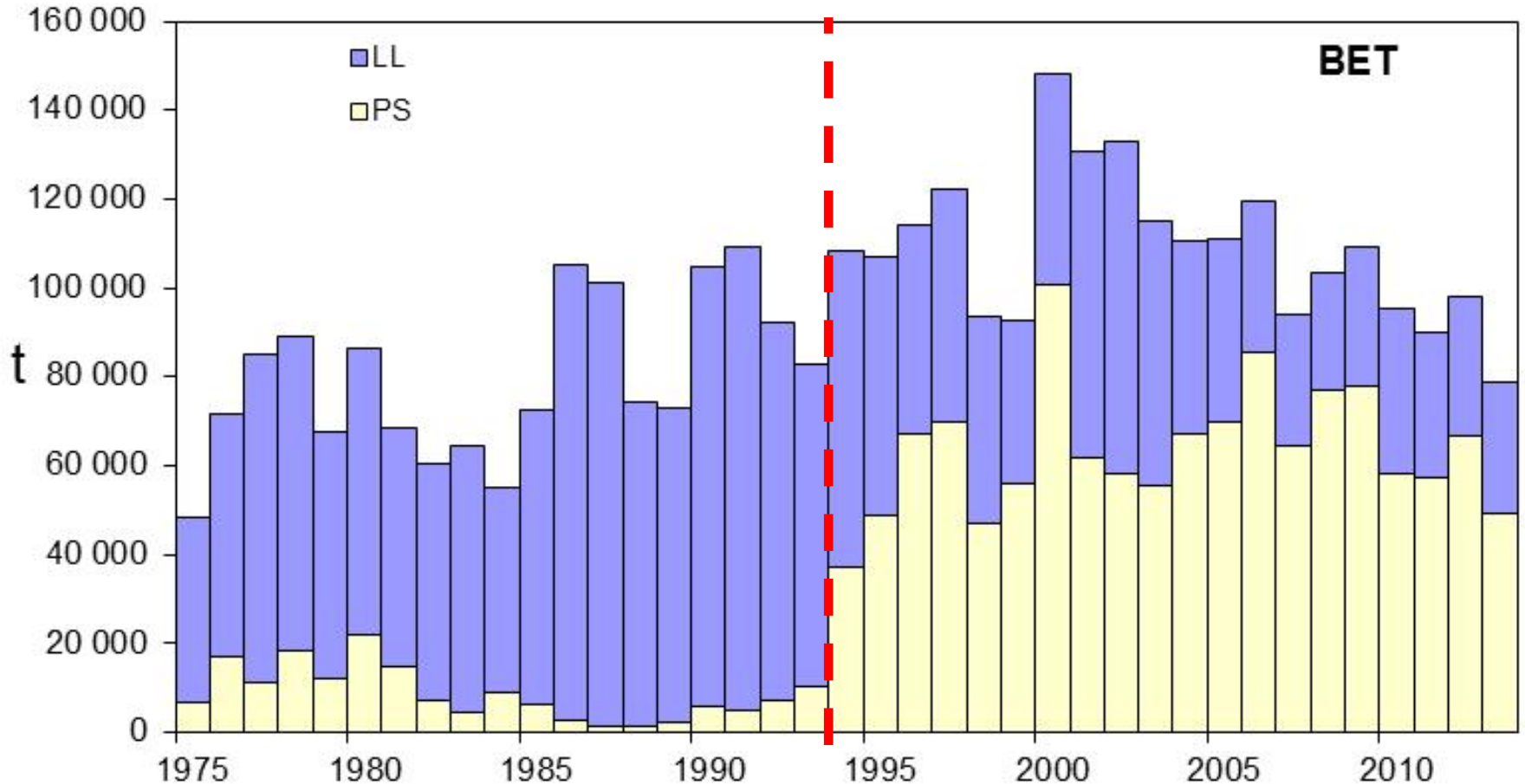
- § New or updated longline catch data: China (2012), Chinese Taipei (2010-2012), Japan (2010-2012), Korea (2012), US (2011-2012), French Polynesia (2012) and Vanuatu (2012)

- § 2013 longline catch data available from monthly reports: China, Chinese Taipei, Japan and Korea

- § New or updated CPUE data available for Japan (2010-2012)

- § New or updated longline size-frequency for Japan (2011-2012)

Total catches



Expansion of FAD fishery





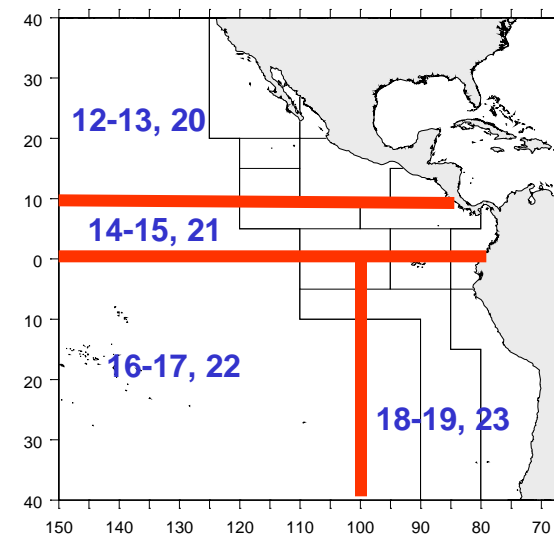
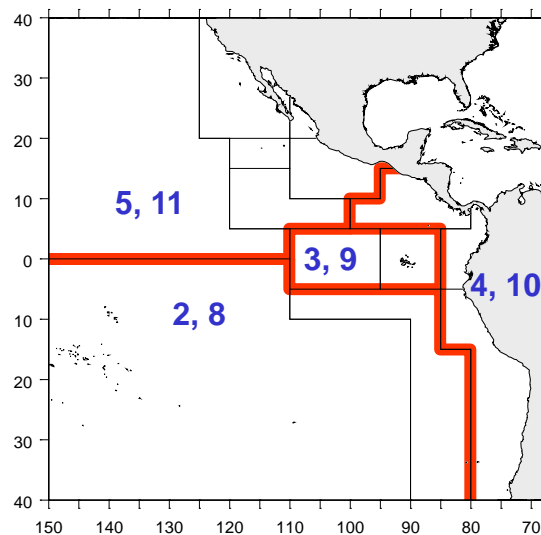
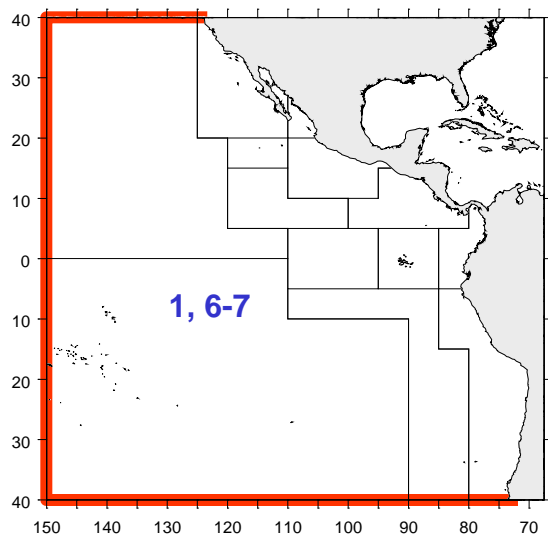
BET fishery definitions

23 fisheries

Early OBJ (1)
Early & Late DEL&NOA (6, 7)

Recent OBJ (2-5)
Discards (8-11)

Early/Late LL N (12-13, 20)
Early/Late LL C (14-15, 21)
Early/Late LL S (16-17, 22)
Early/Late LL I (18-19, 23)



GEAR TYPE: PS, LP, LL
PS set type (OBJ, NOA and DOL)
Time period
The IATTC sampling areas

DEL – sets on dolphins
NOA – sets on unassociated fish
OBJ – sets on floating objects
LL – longline sets





Model assumptions

- Improved after External Review in May 2010 and recent diagnostics work (R_0 profile)
- Data weighting:
 - § Down-weighting size composition data of all fisheries
 - § Fit to Central and Southern LL CPUE series (CV=0.15), no fit to purse seine CPUE
- Modeling of catchability and selectivity:
 - § Two time blocks for all LL fisheries (split at 1990)
 - § Early dome, late asymptotic selectivities (LL-C, LL-S)
 - § Dome-shape selectivity for all surface fisheries





Model assumptions (cont.)

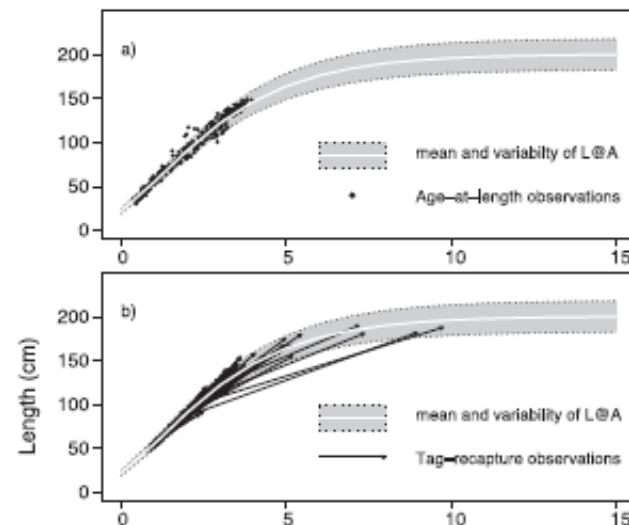
- Growth modeling: New growth curve estimated externally, L_2 and variance of length-at-age fixed



Improved growth estimates from integrated analysis of direct aging and tag-recapture data: An illustration with bigeye tuna (*Thunnus obesus*) of the eastern Pacific Ocean with implications for management

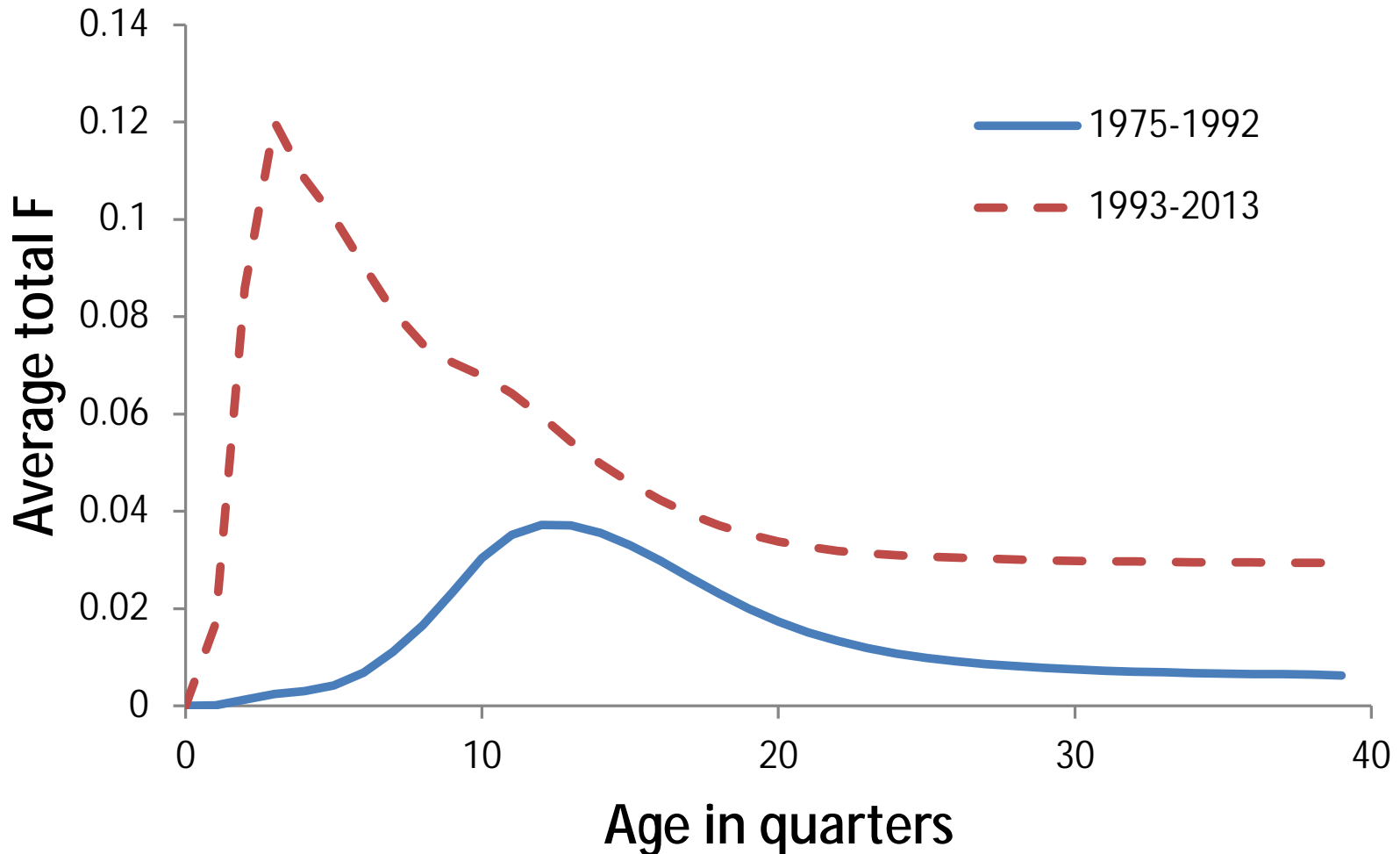
Alexandre M. Aires-da-Silva*, Mark N. Maunder, Kurt M. Schaefer, Daniel W. Fuller

Inter-American Tropical Tuna Commission, 8501 La Jolla Shores Drive, La Jolla, CA 92037-1508, United States



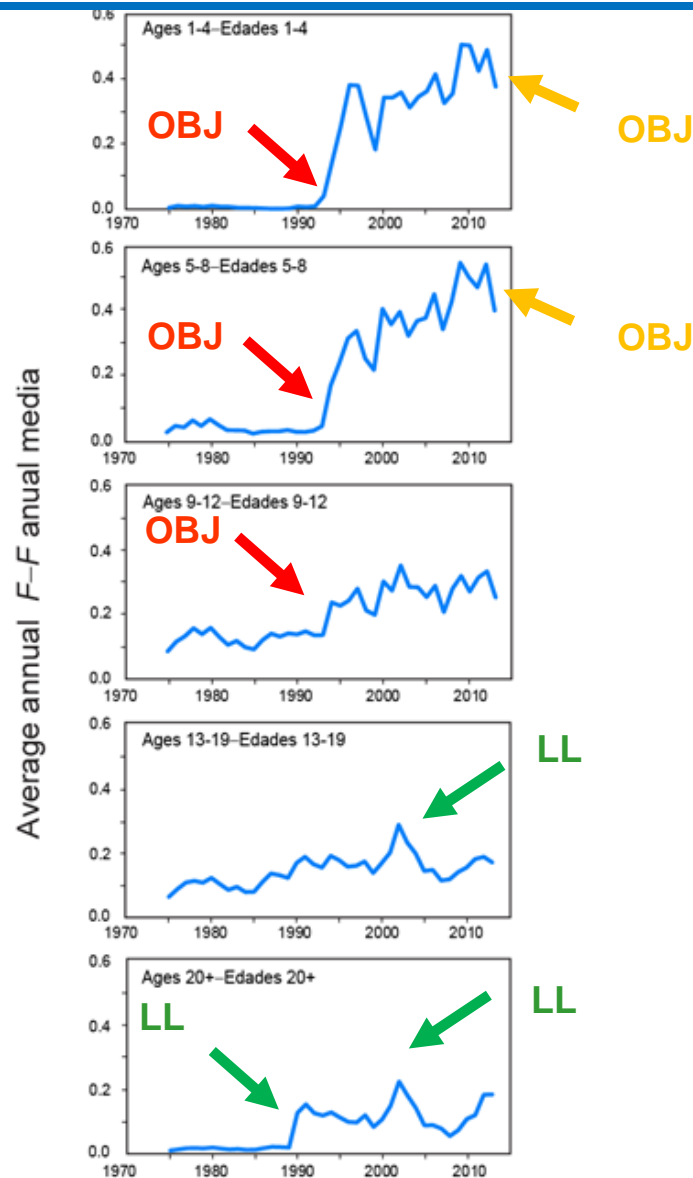
Age-specific fishing mortality

Results
(base case)



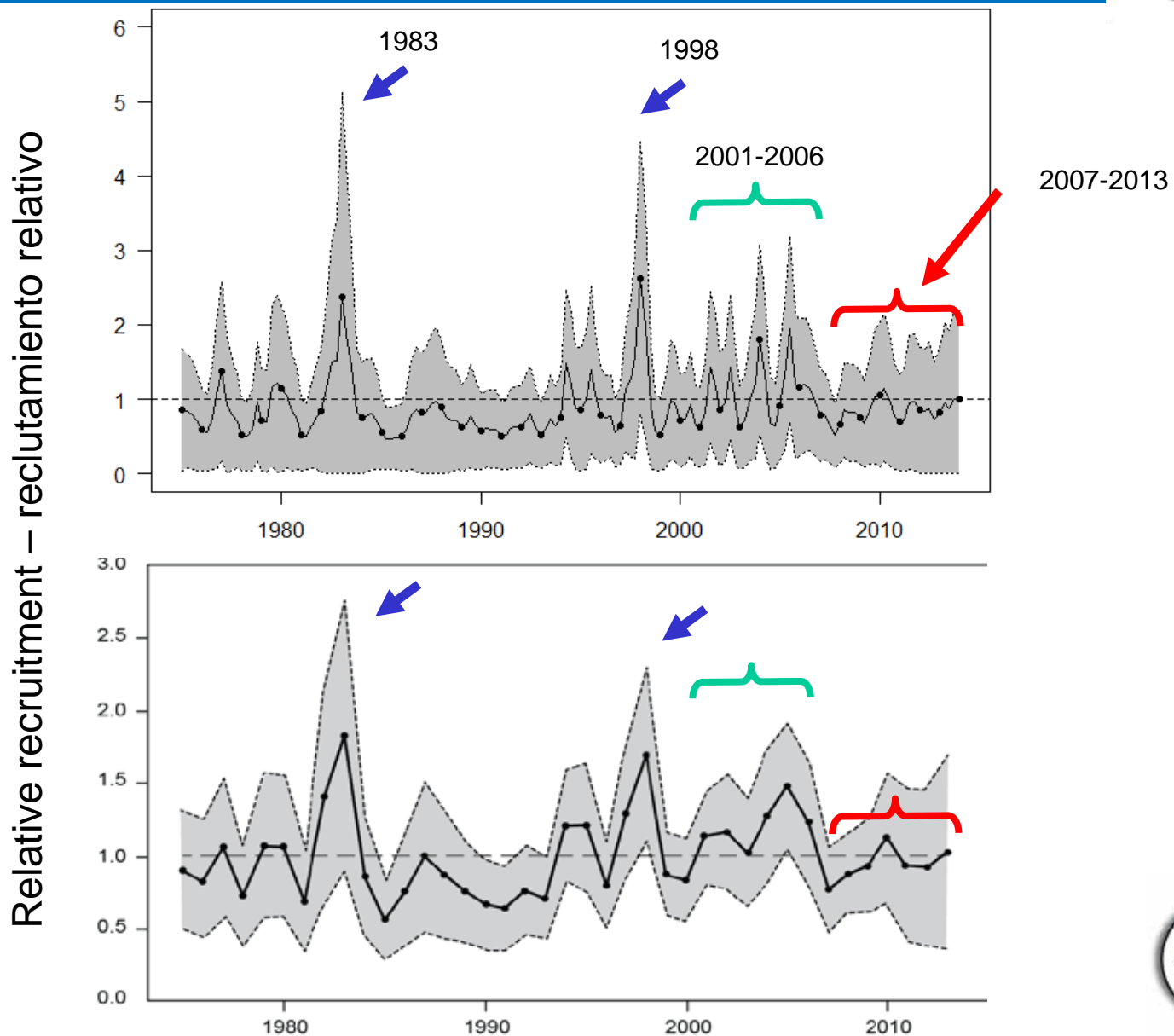
Fishing mortality

Results
(base case)



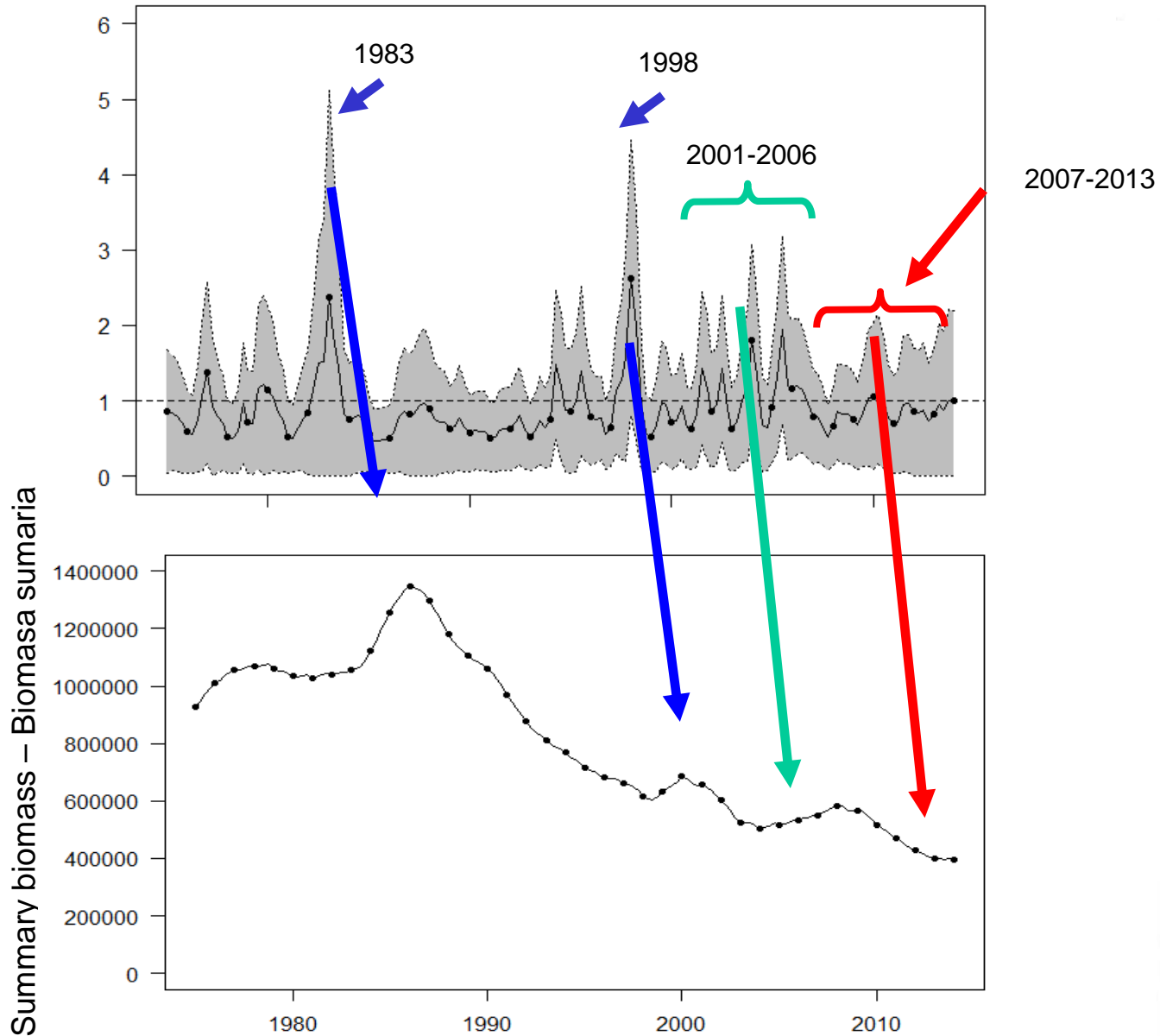
Recruitment

Results
(base case)



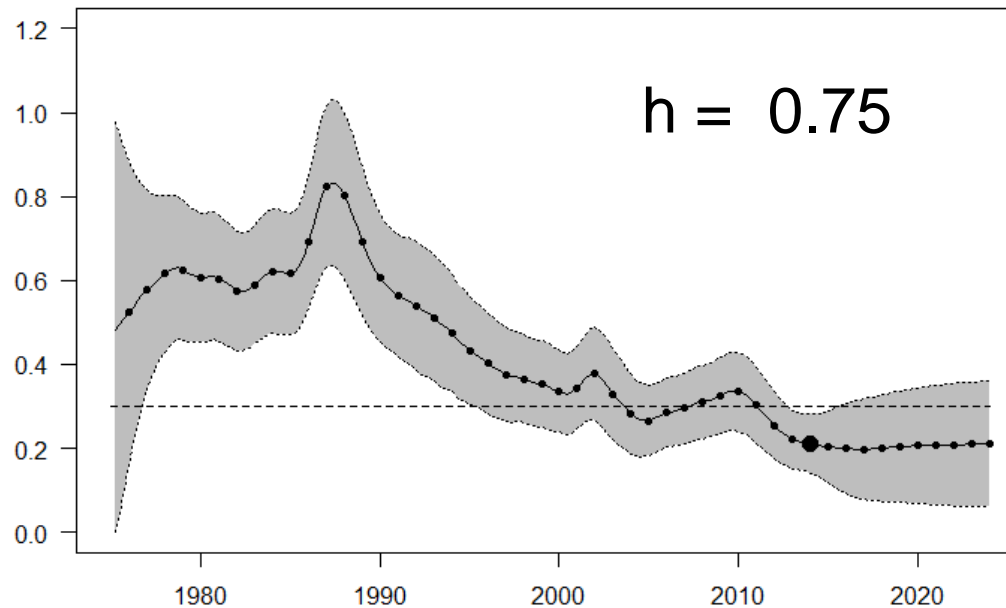
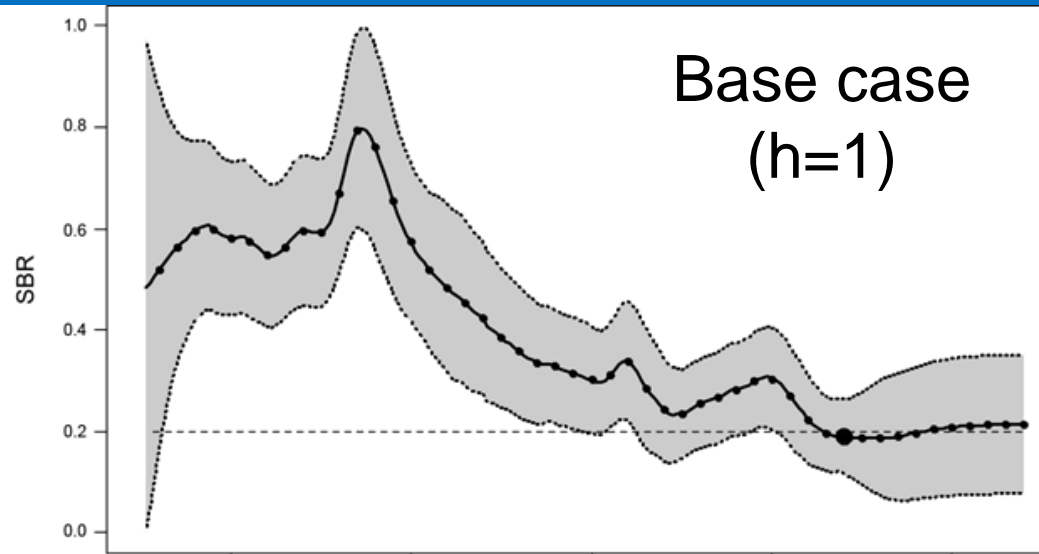
Summary biomass

Results
(base case)



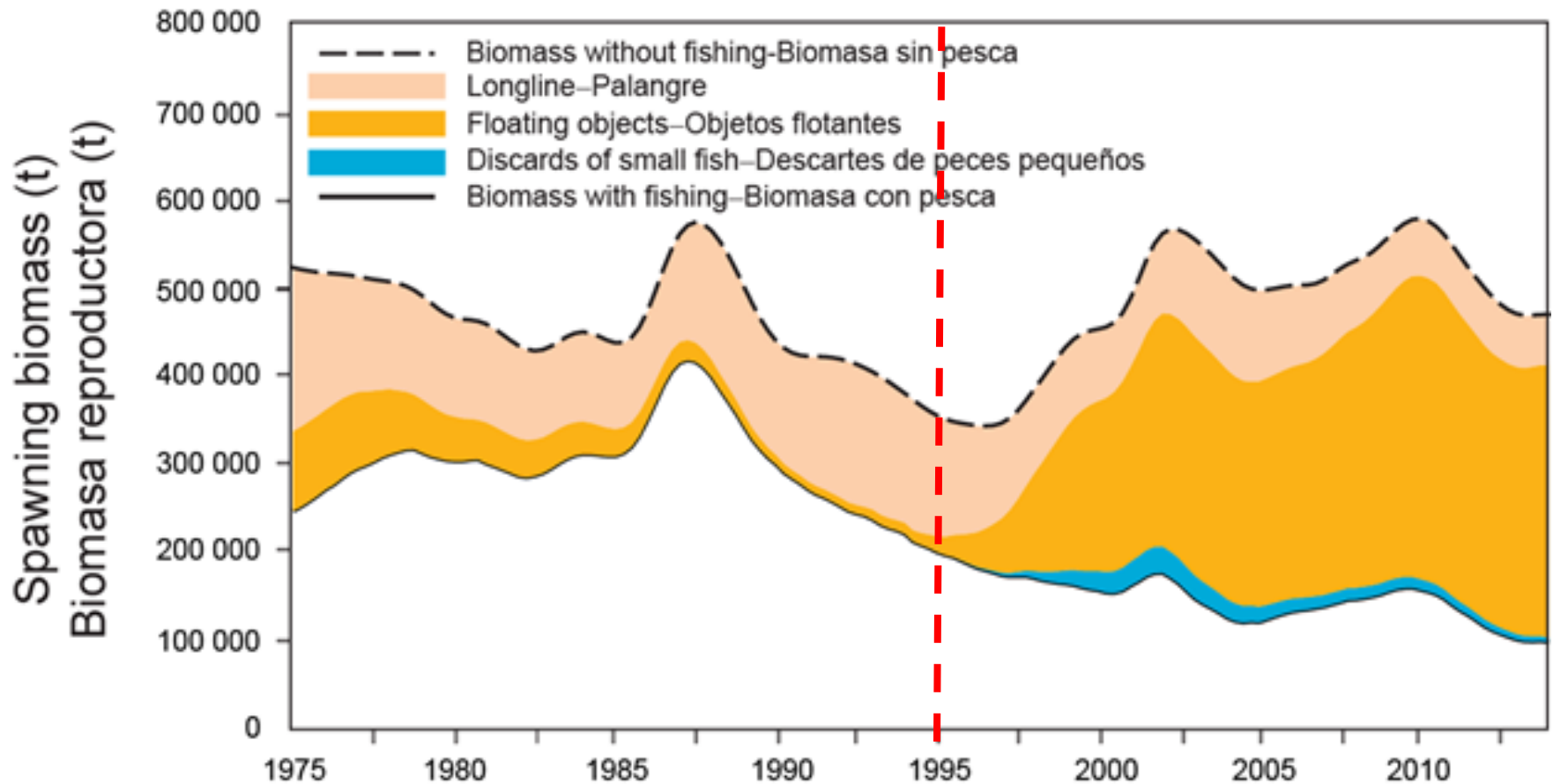
Spawning Biomass Ratio (SBR)

Stock status
(base case)



Fishery impact

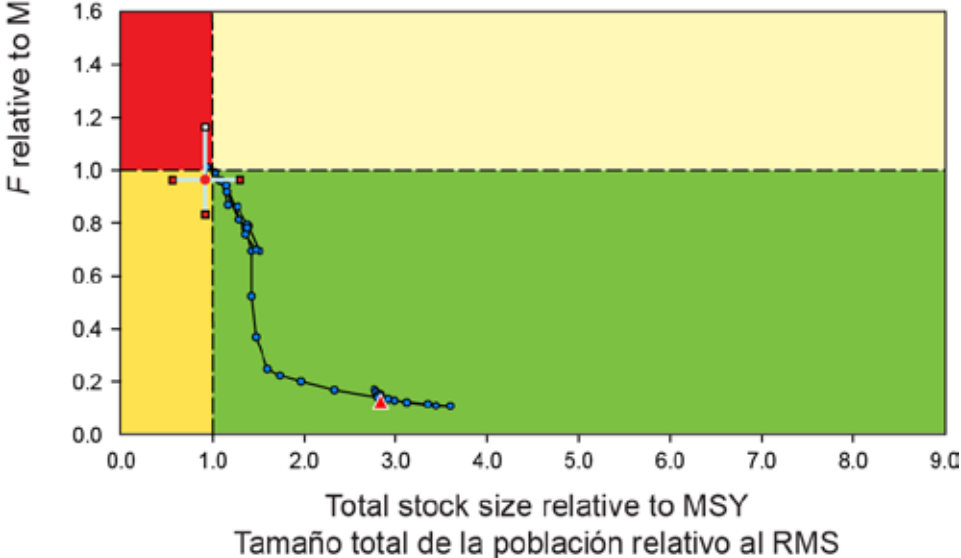
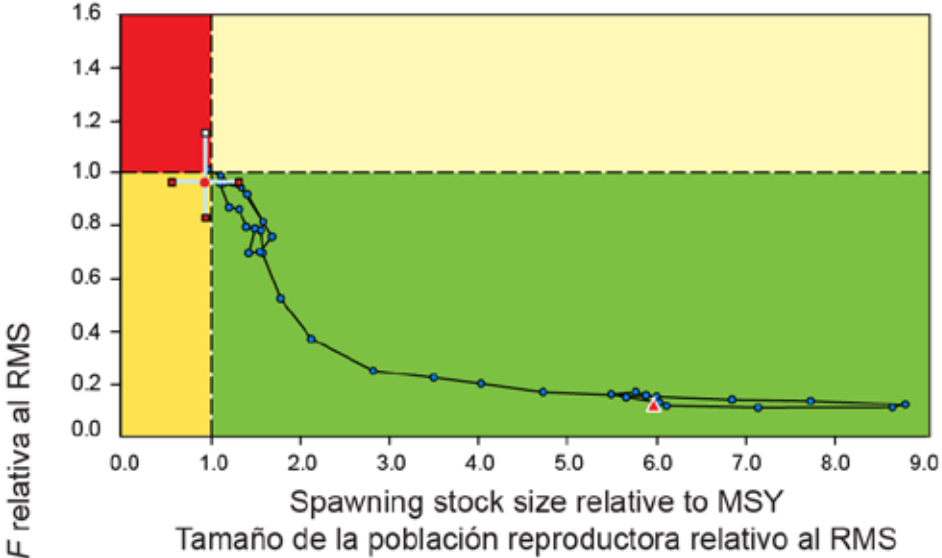
Results
(base case)



OBJ

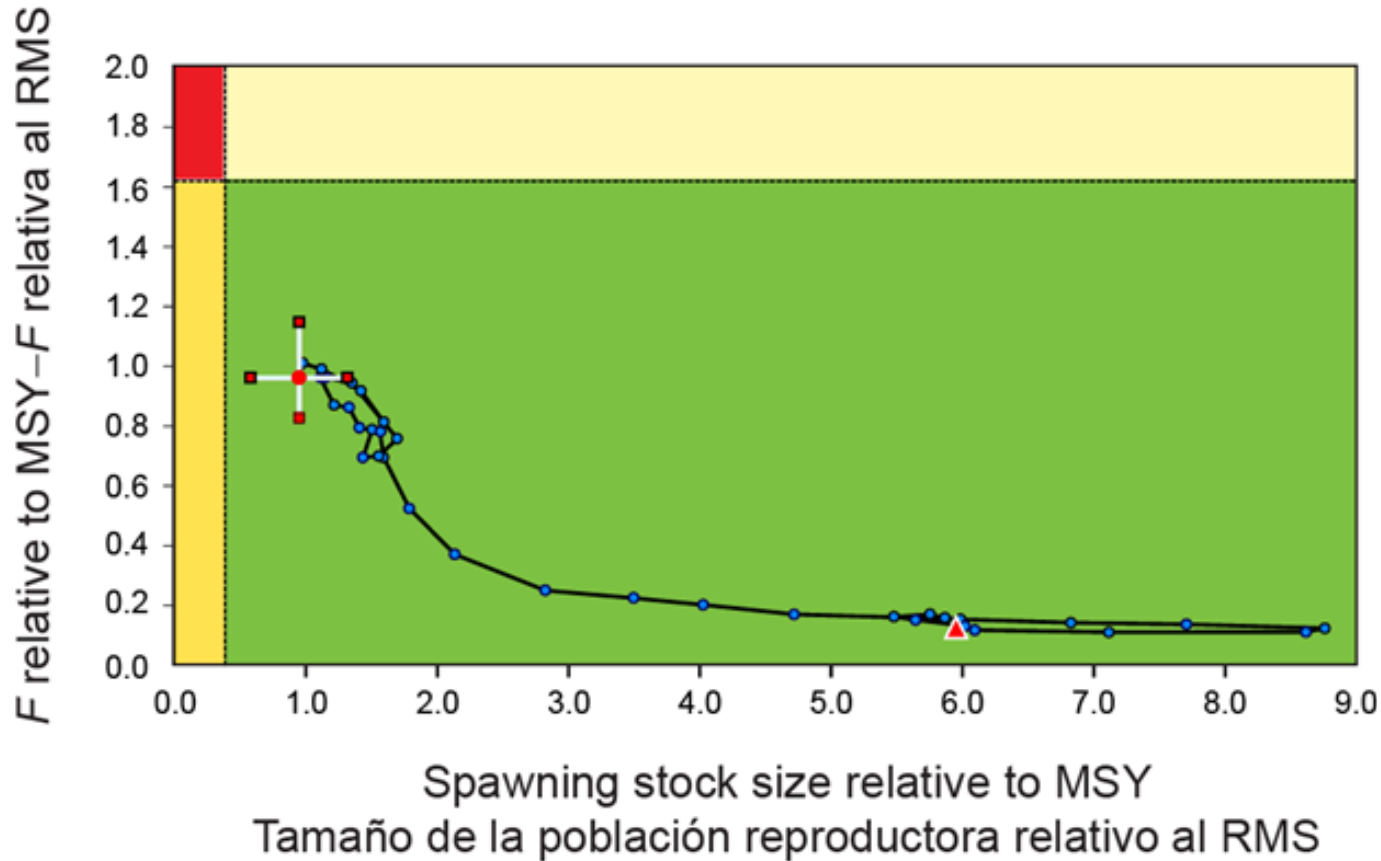


Target Kobe plot



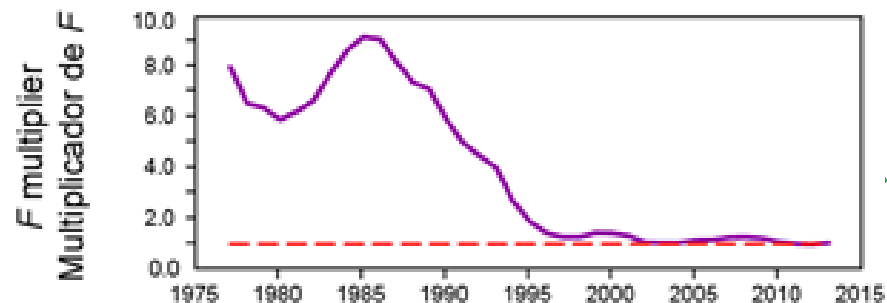
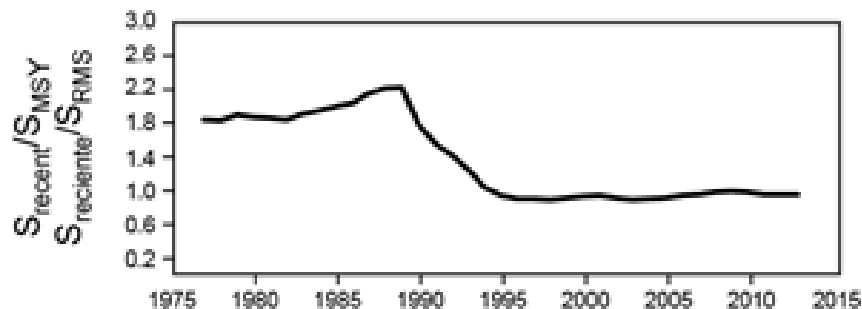
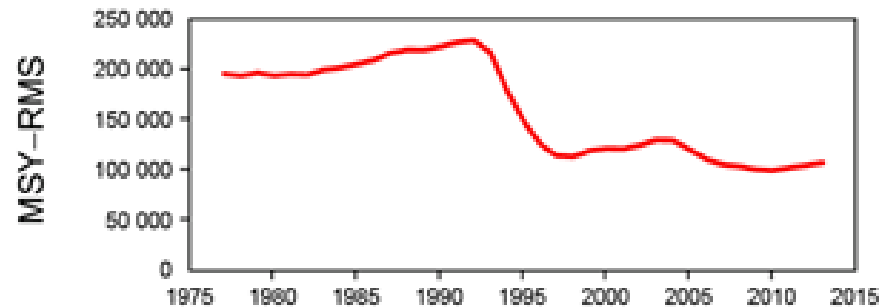
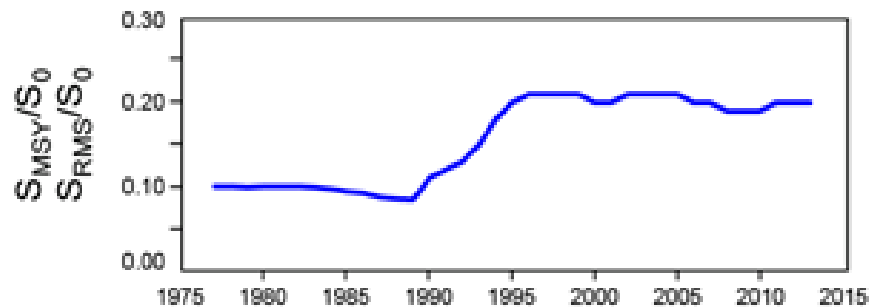
Limit Kobe plot

Stock status
(base case)





Time varying indicators



Management quantities

Stock status
(base case)

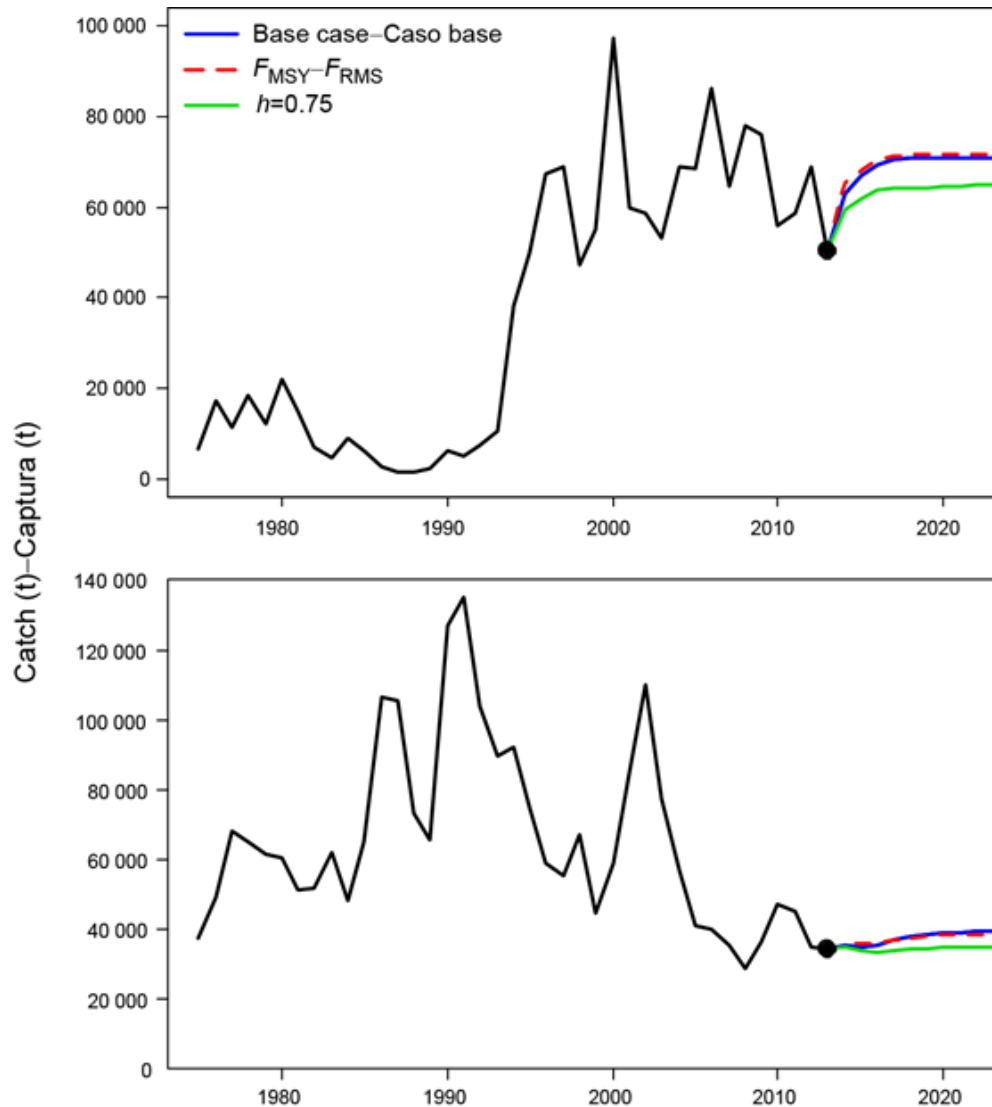


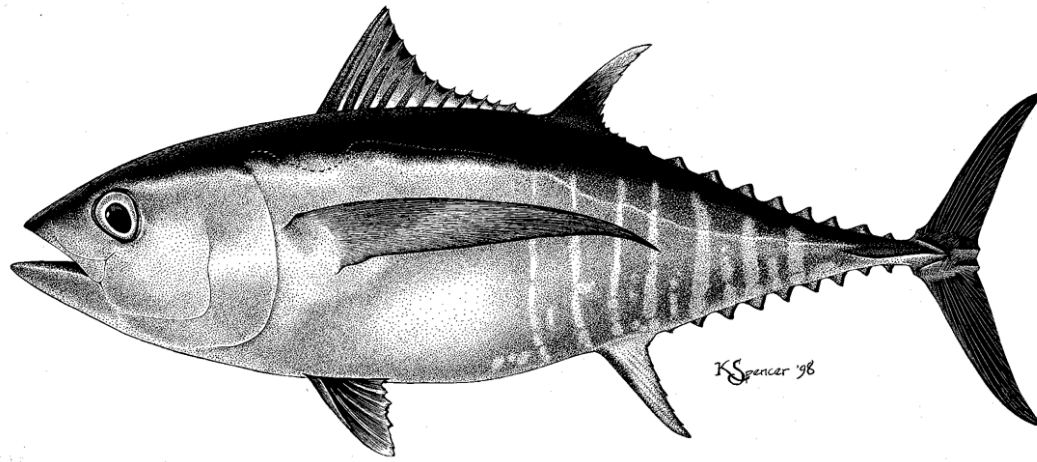
	Base case- Caso base	$h = 0.75$
MSY-RMS	110,458	104,773
$B_{MSY} - B_{RMS}$	420,280	746,794
$S_{MSY} - S_{RMS}$	105,164	207,160
$B_{MSY}/B_0 - B_{RMS}/B_0$	0.25	0.33
$S_{MSY}/S_0 - S_{RMS}/S_0$	0.20	0.30
$C_{recent}/MSY - C_{recent}/RMS$	0.76	0.80
$B_{recent}/B_{MSY} - B_{recent}/B_{RMS}$	0.95	0.73
$S_{recent}/S_{MSY} - S_{recent}/S_{RMS}$	0.95	0.71
F multiplier- Multiplicador de F	1.04	0.81



Projected catches – *Status quo* (F_{cur})

Projections
(base case)





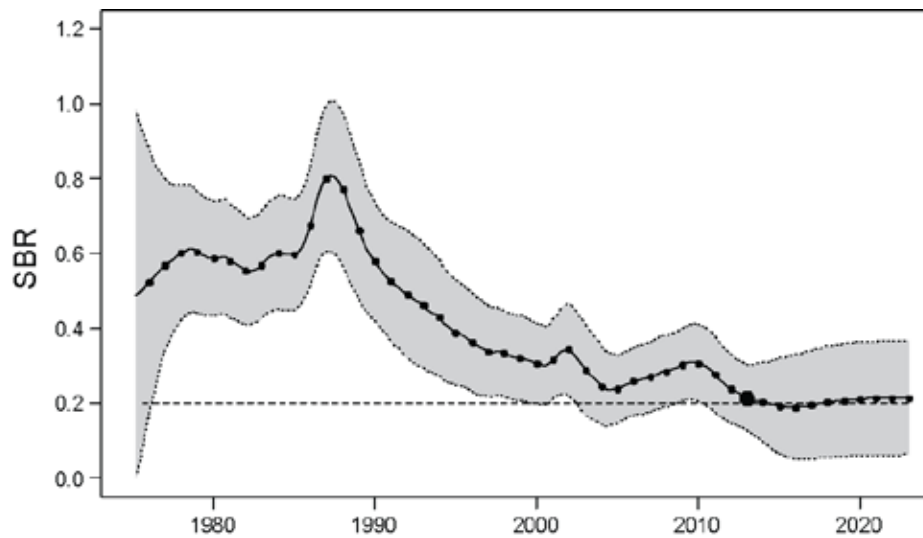
Summary





Summary: key results

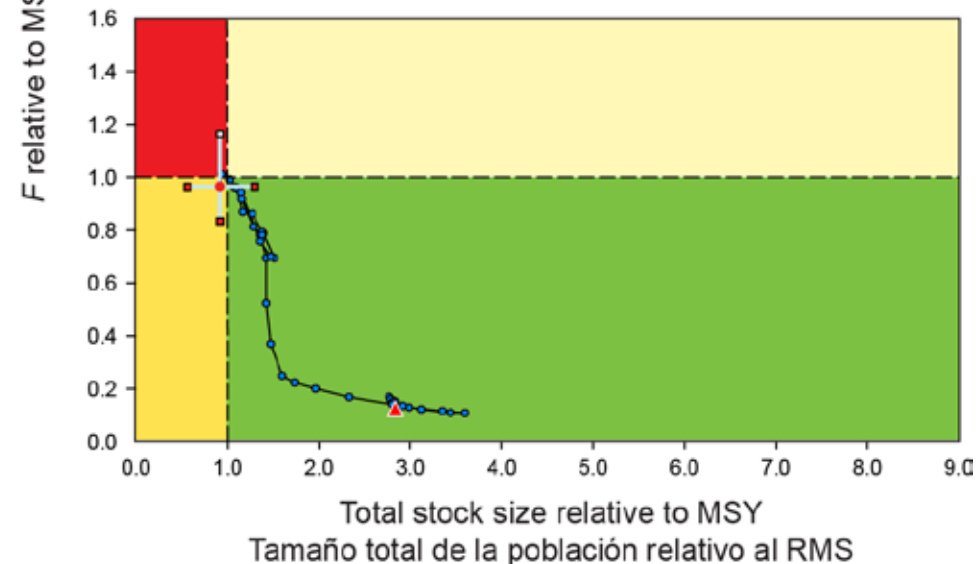
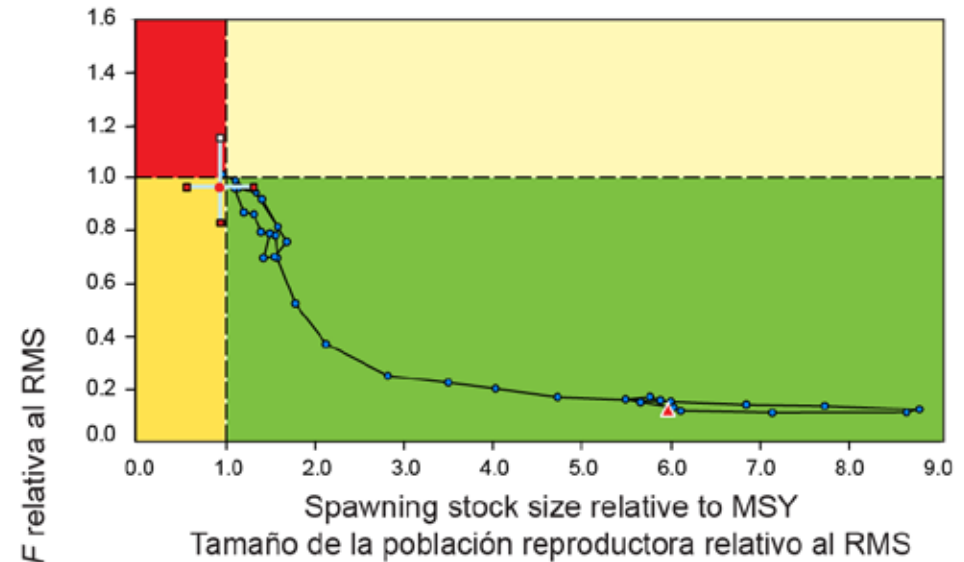
- Recovery trend since 2005 coinciding with beginning of IATTC tuna conservation resolutions
- But this recovery was not sustained since 2010 and biomasses were reduced to lowest historic levels at the start of 2014
- The recent decline may be related to series of below average recruitments coinciding with strong La Nina events (since 2007)
- However, at current fishing mortality levels, and average recruitment, SBR is predicted to stabilize at about SBR at MSY





Summary: key results (cont.)

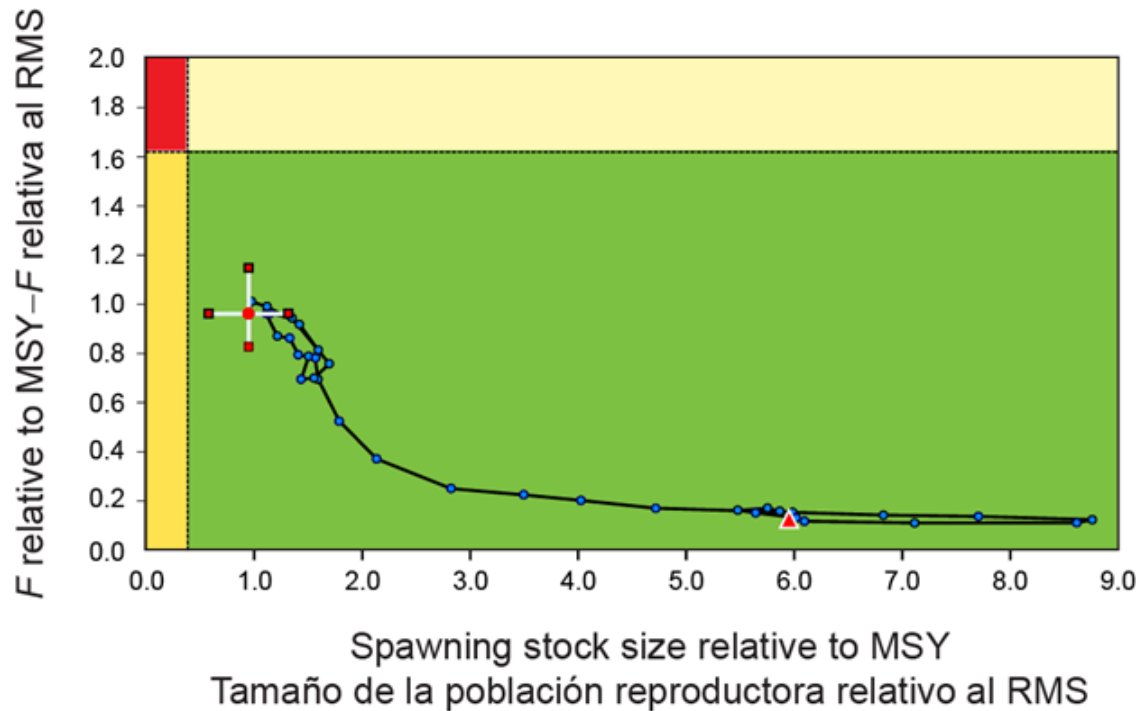
- The recent levels of spawning biomass are estimated to be slightly below the MSY level ($S_{\text{recent}} < S_{\text{MSY}}$), **overfished**
- The recent fishing mortality rates are estimated to be below the level corresponding to MSY ($F_{\text{recent}} < F_{\text{MSY}}$), **overfishing not taking place**
- But the recent estimates are uncertain (low precision)





Summary: key results (cont.)

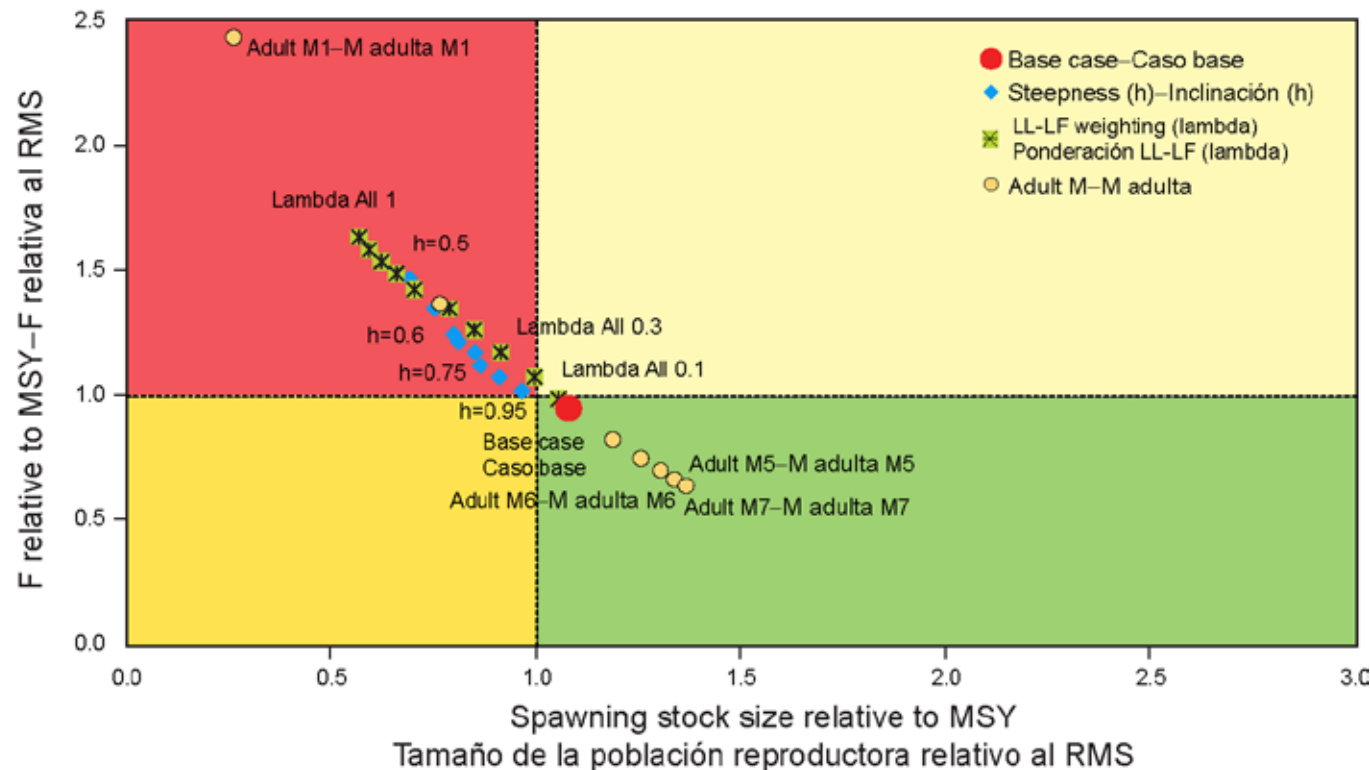
- Proposed limit reference points of $0.38 S_{MSY}$ and $1.6 F_{MSY}$ have not been exceeded





Summary: key results (cont.)

- However, these interpretations are highly sensitive about the following assumptions:
 - § Steepness of stock-recruitment relationship
 - § Adult natural mortality levels
 - § Weighting assigned to the size composition data



Plausible Sensitivities and Uncertainties



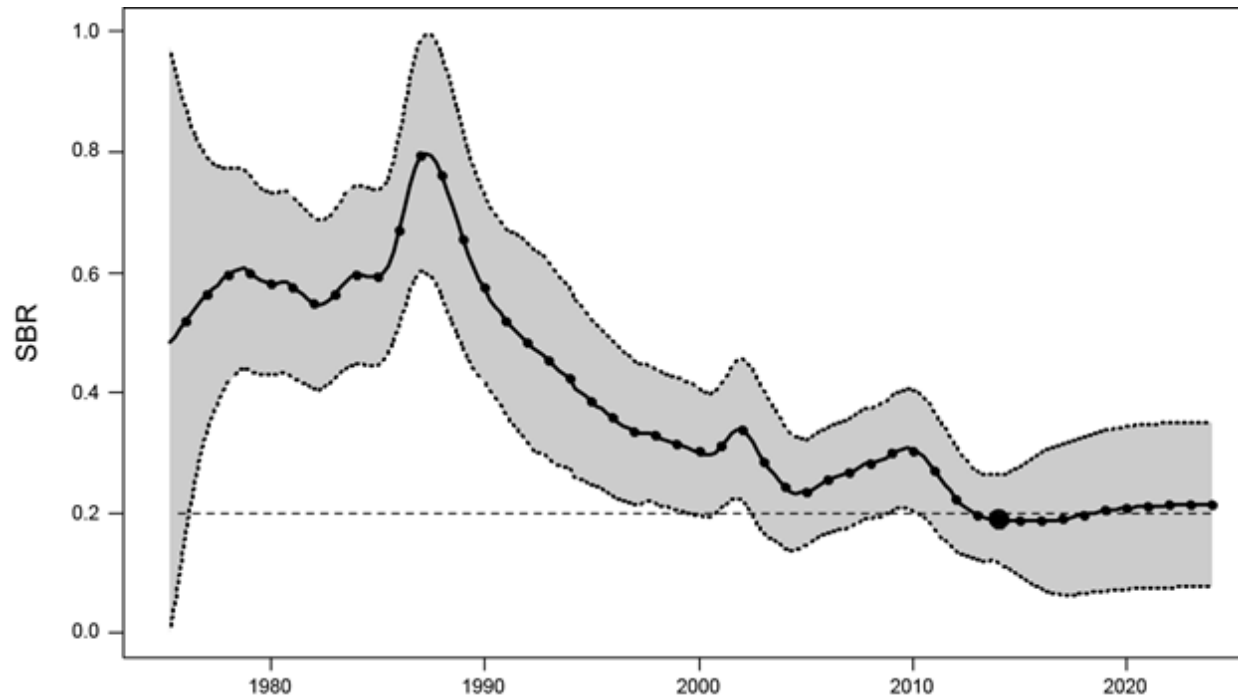
- Results are more **pessimistic** with:
 - § The inclusion of a stock-recruitment relationship
 - § Lower rates of adult natural mortality (M)
 - § Up-weighting the size composition data (LL in particular)
 - § Higher L_2 (but uncertainty has been reduced with recent growth study)

- Results are more **optimistic** with:
 - § Higher rates of adult natural mortality (M)
 - § Lower L_2 (unlikely under the recent growth study)



What is robust

- Relative trend
- Recent decline in biomasses
- Lower biomass compared to historic levels



Questions?

