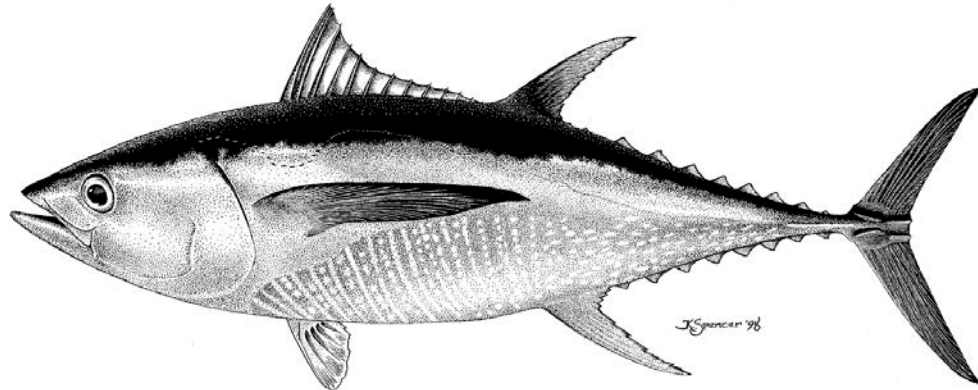


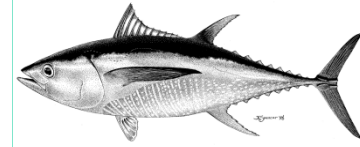
Issues in the EPO YFT assessment

Alexandre Aires-da-Silva and Mark Maunder

External review of IATTC yellowfin tuna assessment
La Jolla, USA, 15-19 October, 2012

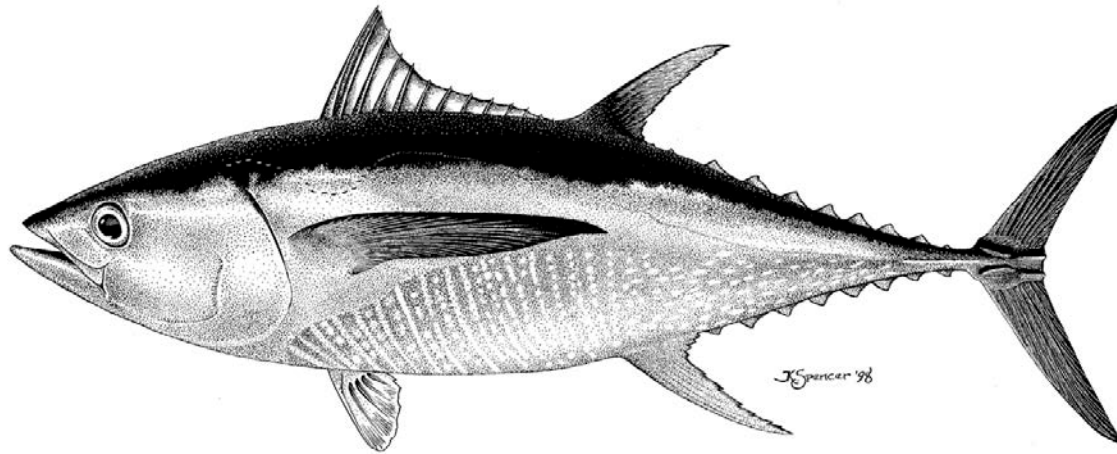


Issues in YFT assessment



- Uncertainty in biological parameters
 - Steepness
 - Growth (in particular L_2)
 - Natural mortality
- Retrospective pattern
- Treatment of selectivity
 - Time-varying issues
 - Apparent numerical and convergence issues related to selectivity
- Data weighting
 - Misfit to CPUE LL-S and DEL-N
 - Model wants higher effective sample sizes of the size comps.
- Environmental regime shifts



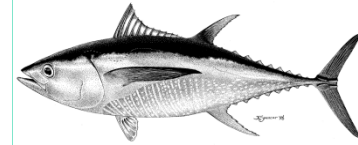


Uncertainty in biological parameters

- Steepness (h)
- Growth
- Natural mortality (M)

YFT stock-recruitment relationship

Assumptions

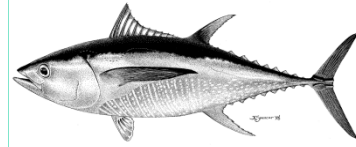


- Beverton-Holt relationship
- No S-R relationship (steepness = 1)
- Sensitivity analysis ([Appendix A](#))
 - Steepness = 0.75
 - Likelihood profile on steepness (0.6, 0.7, 0.8, 0.9, 1.0)

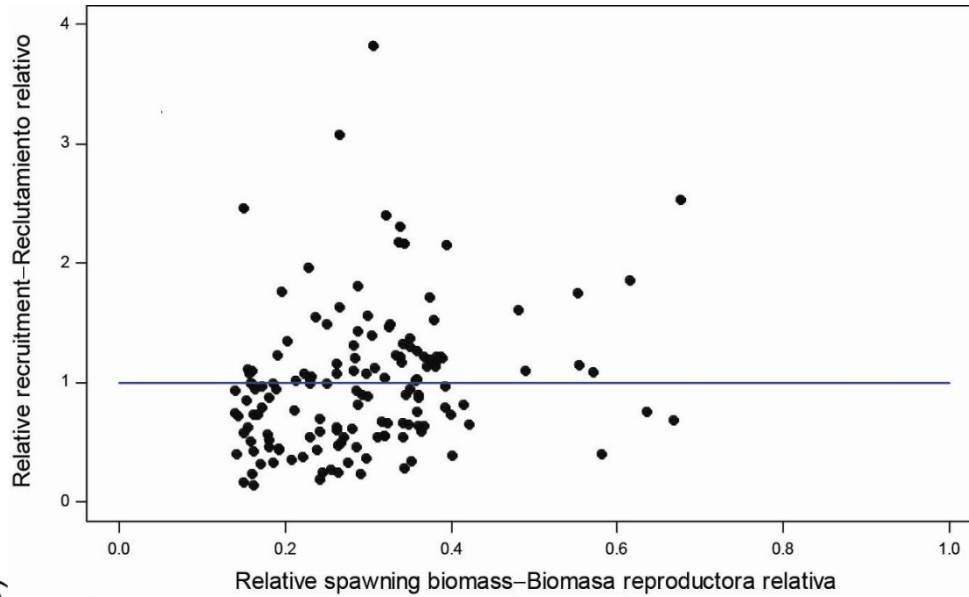


Stock-recruitment

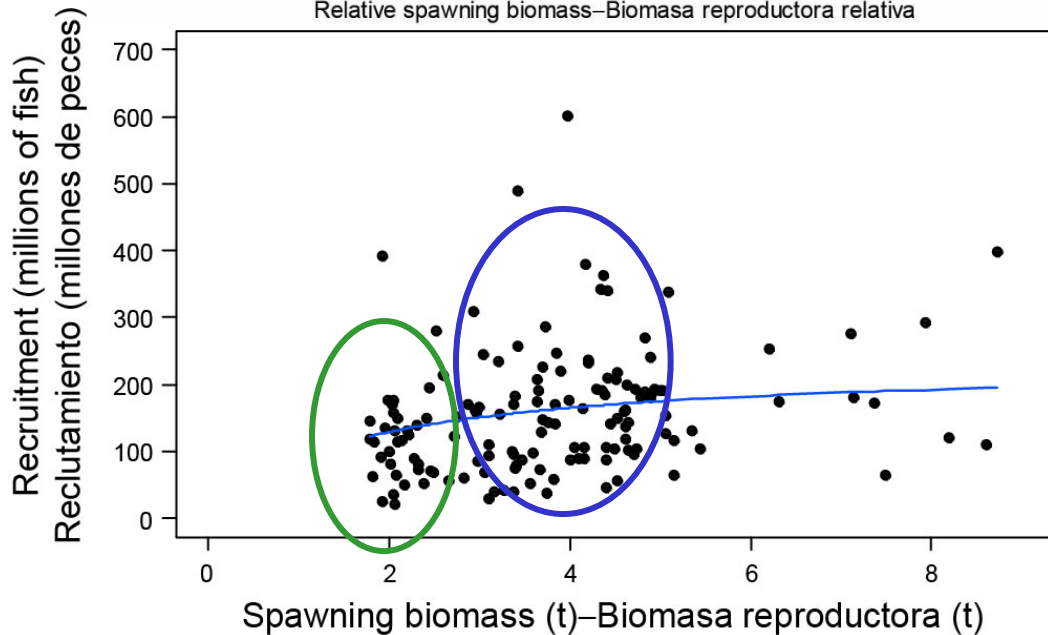
S-R



Base case
($h=1$)

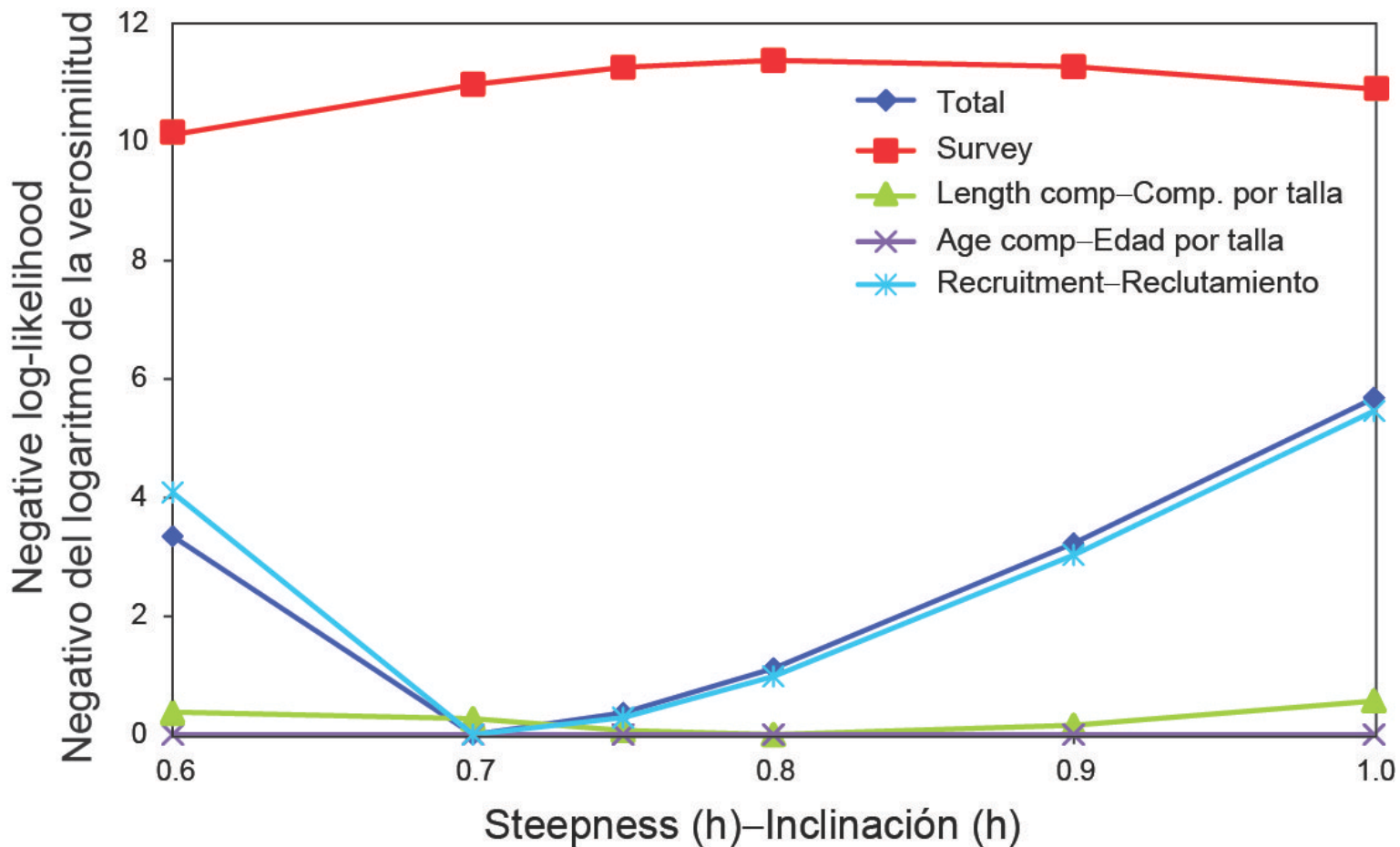
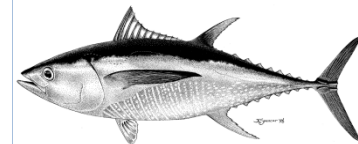


$h=0.75$)



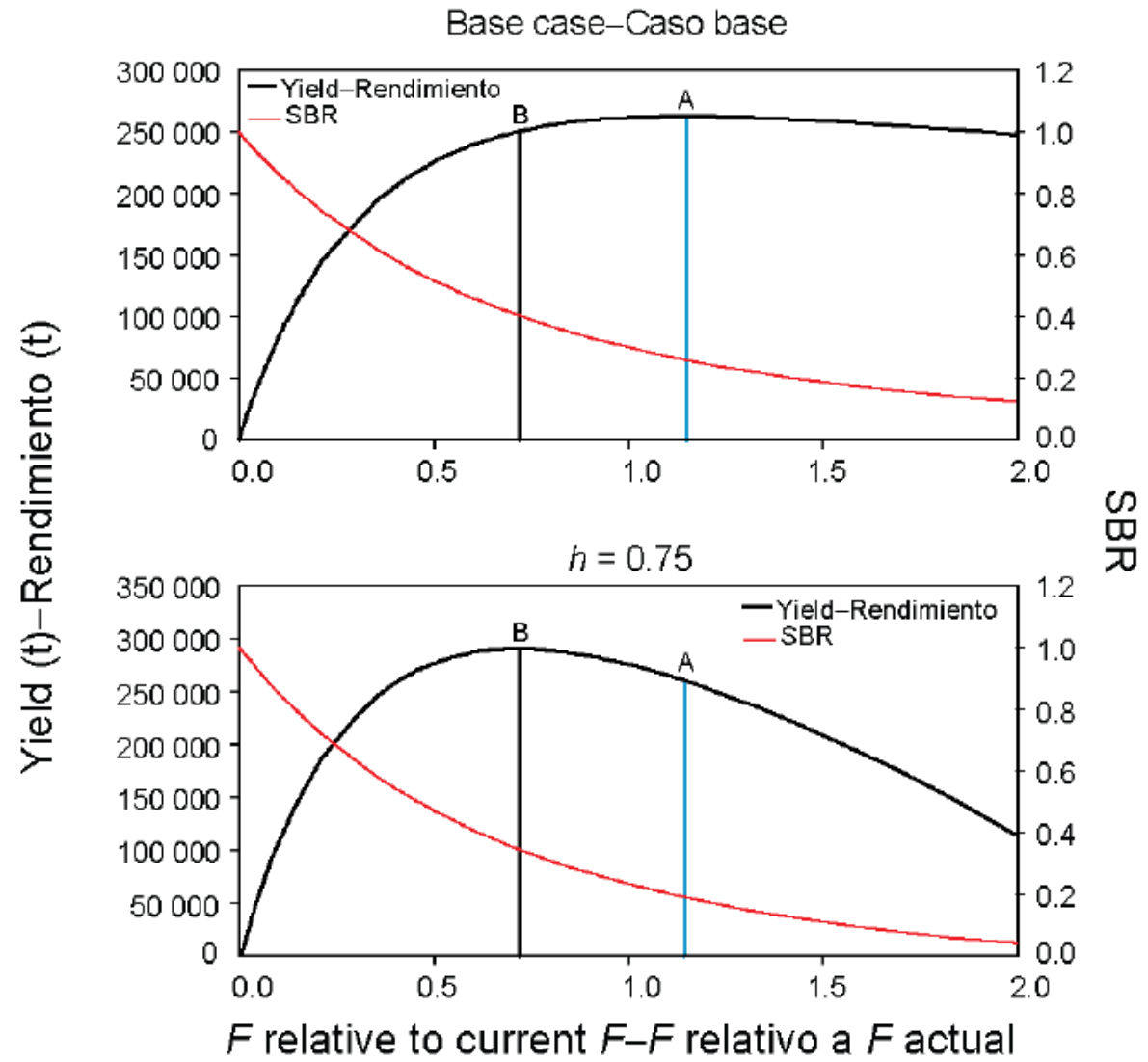
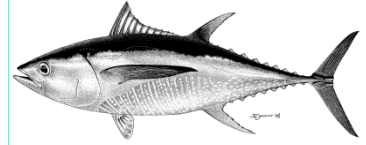
Likelihood profile on h

S-R



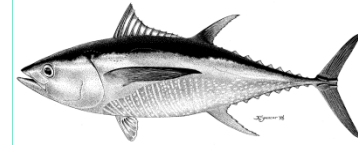
Yield

S-R



YFT stock-recruitment relationship

S-R



DOCUMENT YFT-01-05 (DRAFT)

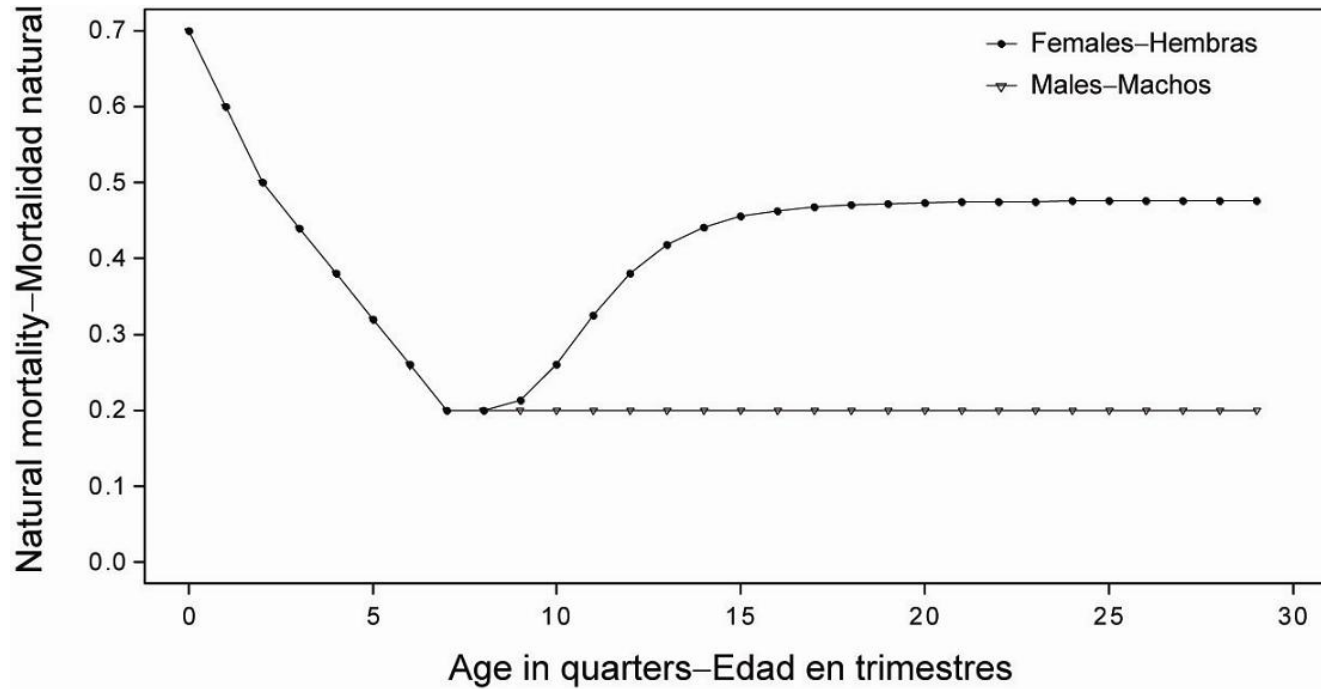
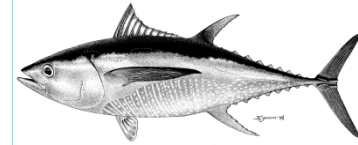
**A REVIEW AND EVALUATION OF RECRUITMENT AND THE STOCK-
RECRUITMENT RELATIONSHIP FOR THE ASSESSMENT AND
MANAGEMENT OF YELLOWFIN TUNA IN THE
EASTERN PACIFIC OCEAN**

Mark N. Maunder and Alexandre Aires-da-Silva CONTENTS

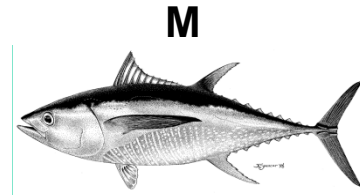


YFT natural mortality (M)

S-R



YFT natural mortality (M)



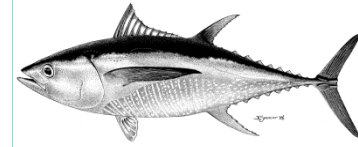
DOCUMENT YFT-01-07 (DRAFT)

**A REVIEW AND EVALUATION OF NATURAL MORTALITY FOR THE
ASSESSMENT AND MANAGEMENT OF YELLOWFIN TUNA IN THE
EASTERN PACIFIC OCEAN**

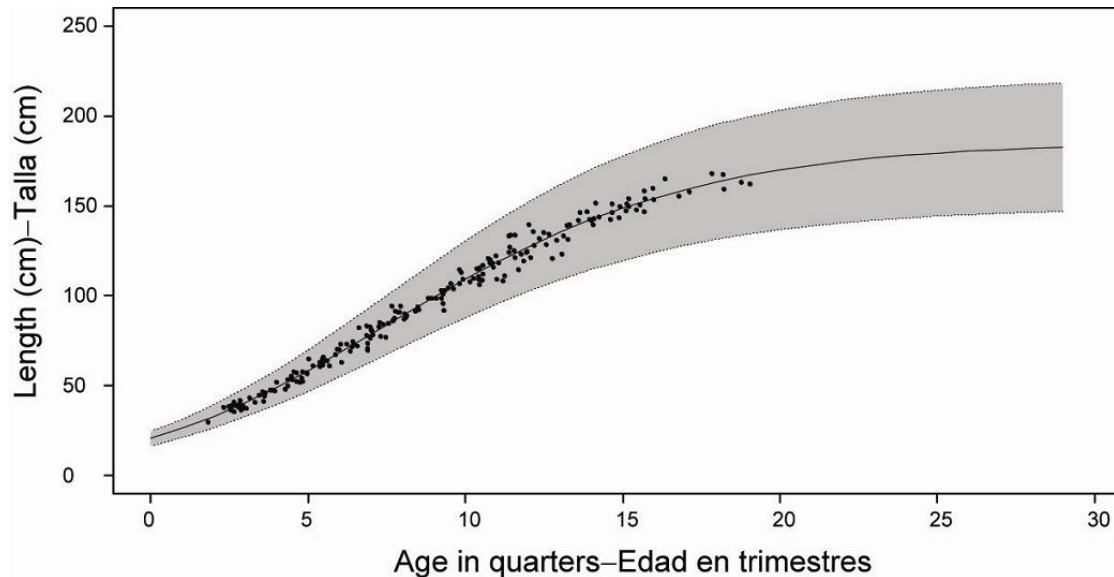
Mark N. Maunder and Alex Aires-da-Silva

YFT age and growth

Assumptions

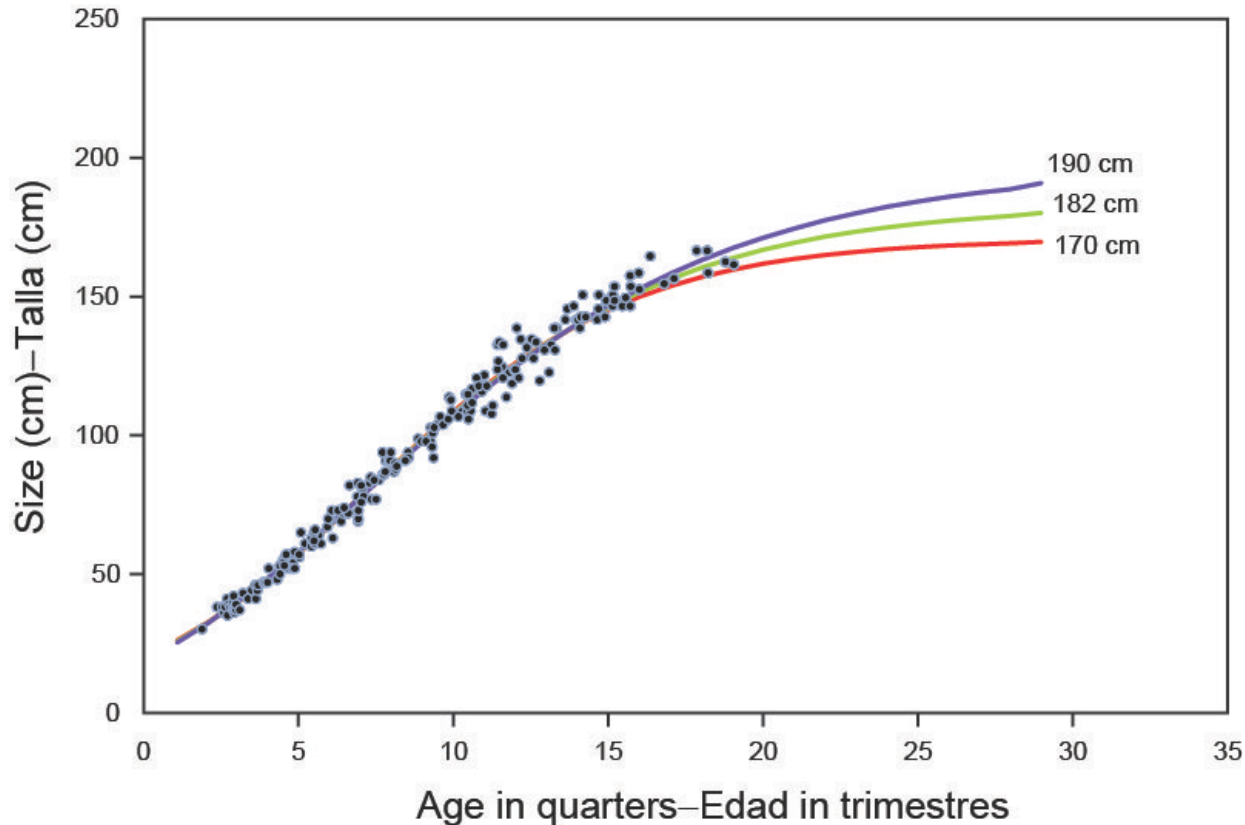
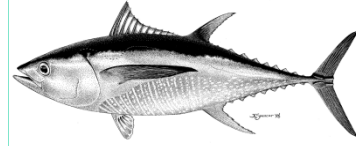


- Richards growth curve
 - Growth parameters fixed (Maunder and Aires-da-Silva, 2009)
 - Variability of length-at-age fixed, CV of $L@A$ linear $f(\text{age})$



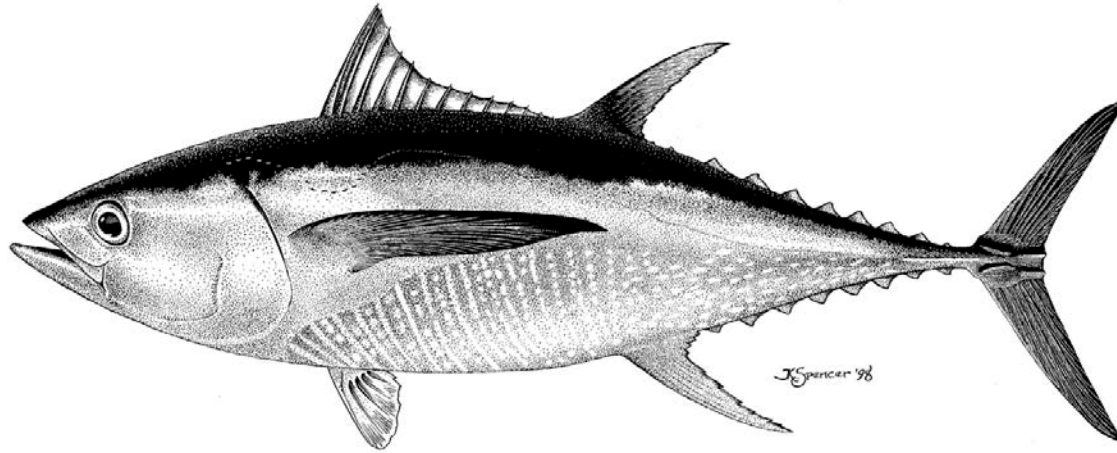
Fixed values of L_2

Growth
(L_2)



- See [Document YFT-01-04](#) for new growth estimates from integrated age-at-length and tagging data

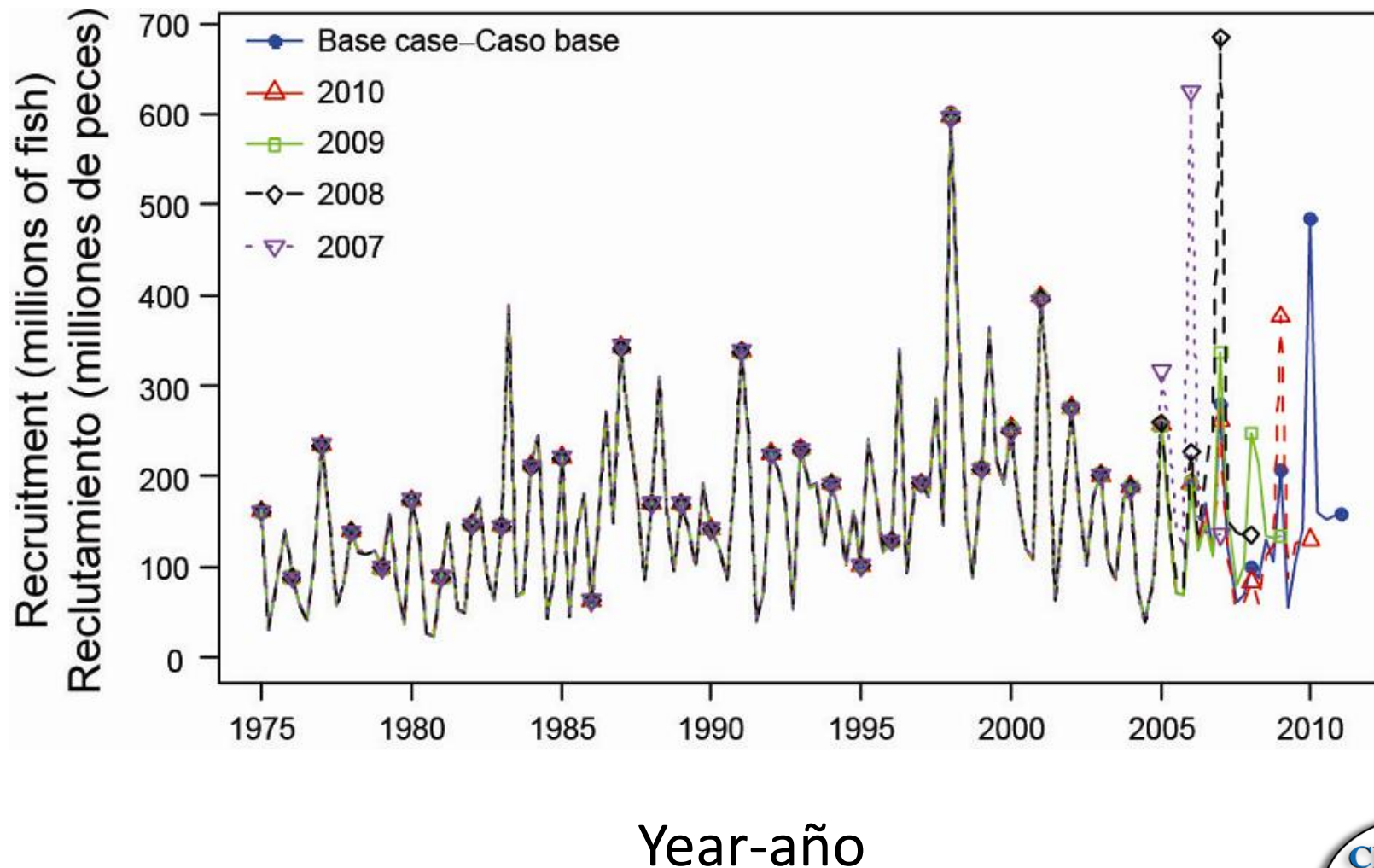
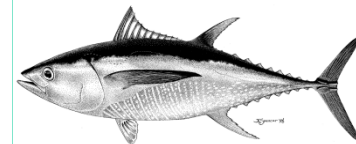




Retrospective pattern

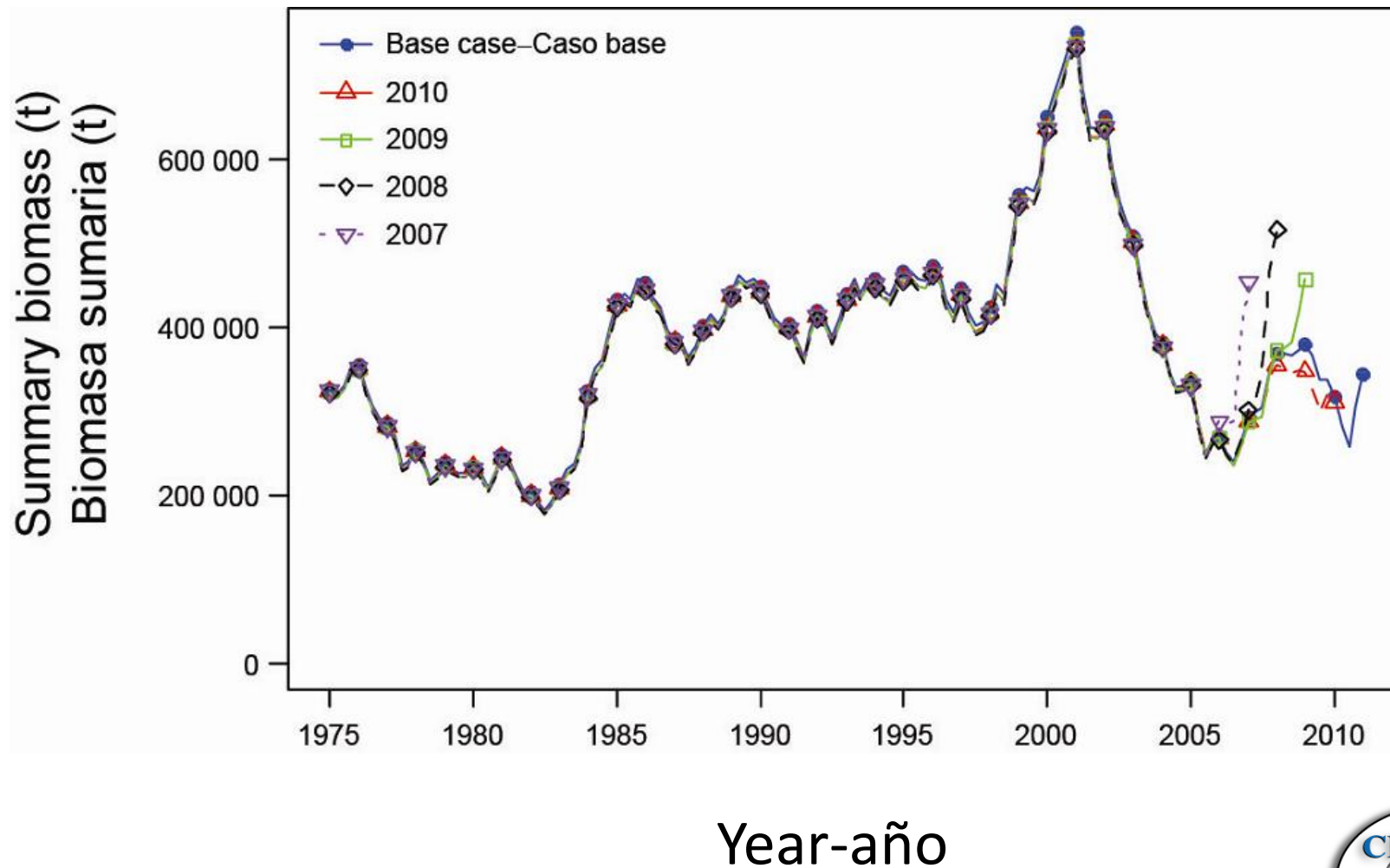
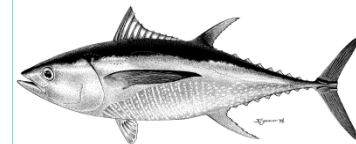
Recruitment

Retrospective



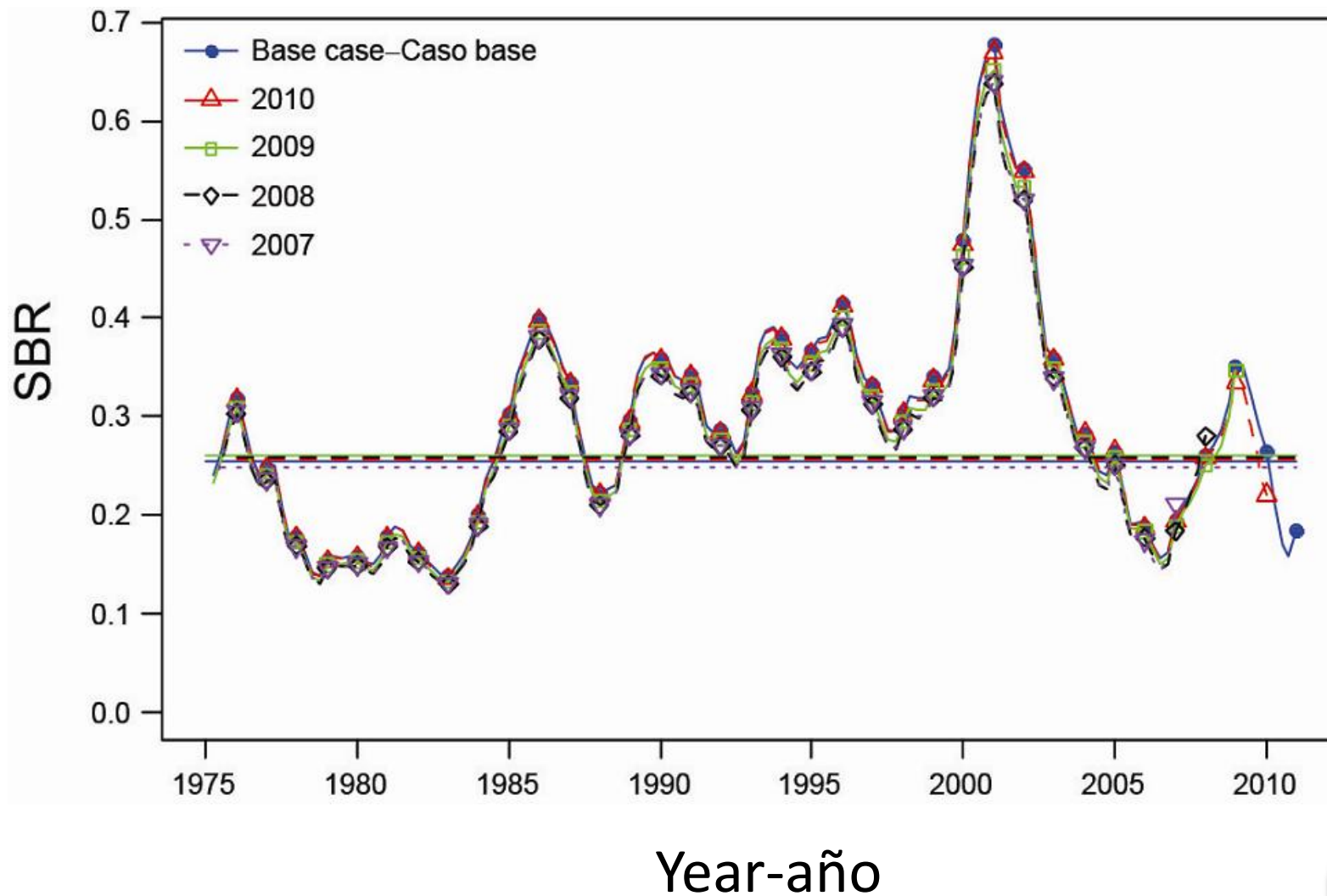
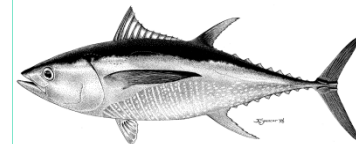
Summary biomass

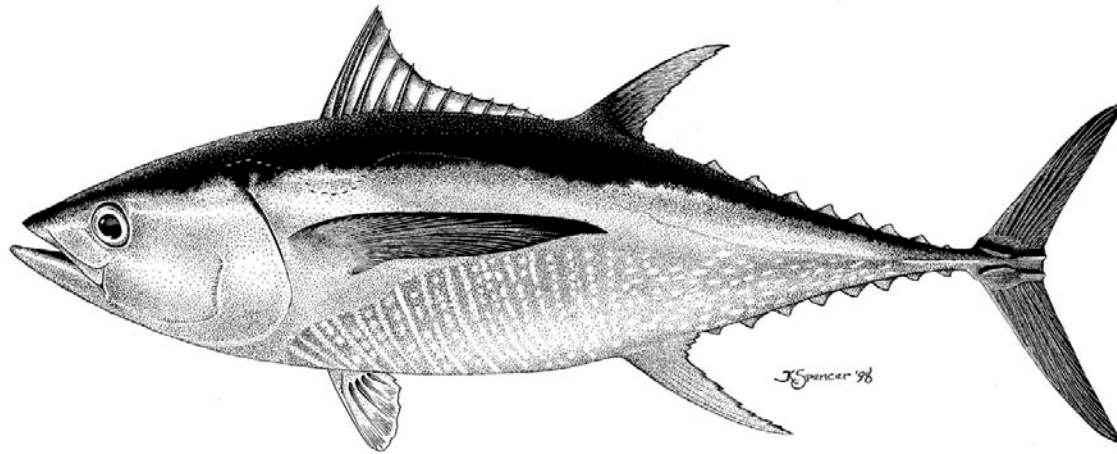
Retrospective



Spawning biomass ratio

Retrospective



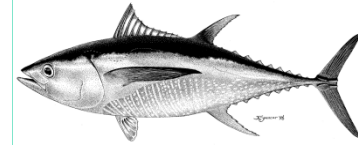


Selectivity issues

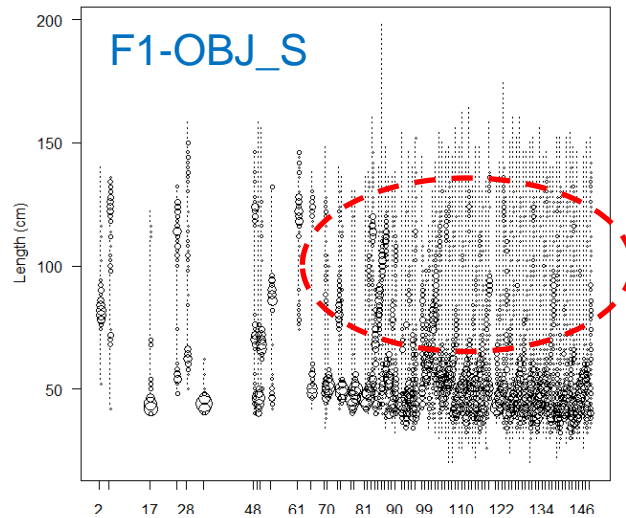
- Time-varying issues
- Numerical and convergence issues related to selectivity

OBJ time-varying selectivity?

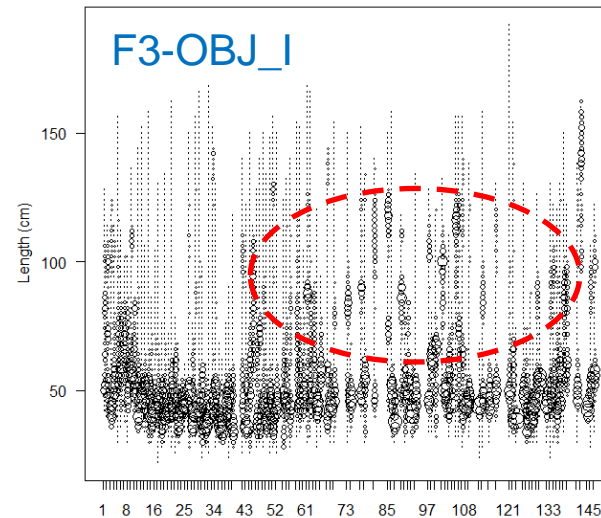
Selectivity



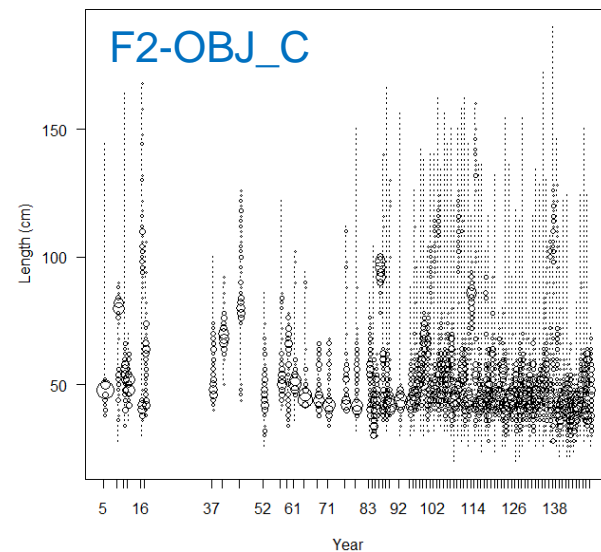
length comp data, sexes combined, whole catch, F1-OBJ_S (max=0.48)



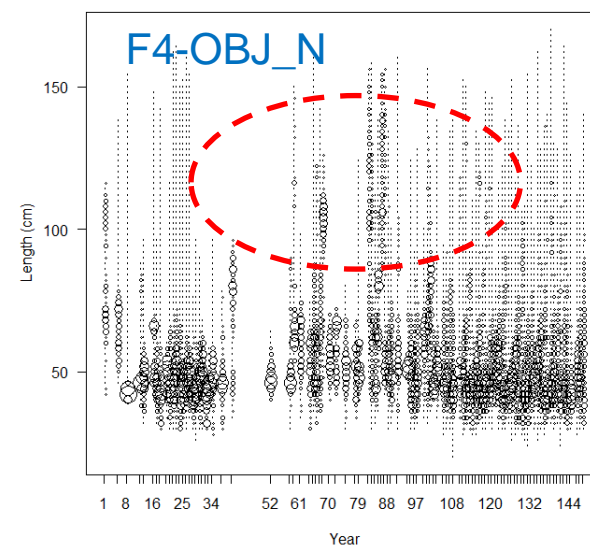
length comp data, sexes combined, whole catch, F3-OBJ_I (max=0.47)



length comp data, sexes combined, whole catch, F2-OBJ_C (max=0.53)

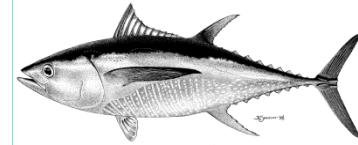


length comp data, sexes combined, whole catch, F4-OBJ_N (max=0.46)



OBJ time-varying selectivity?

Selectivity

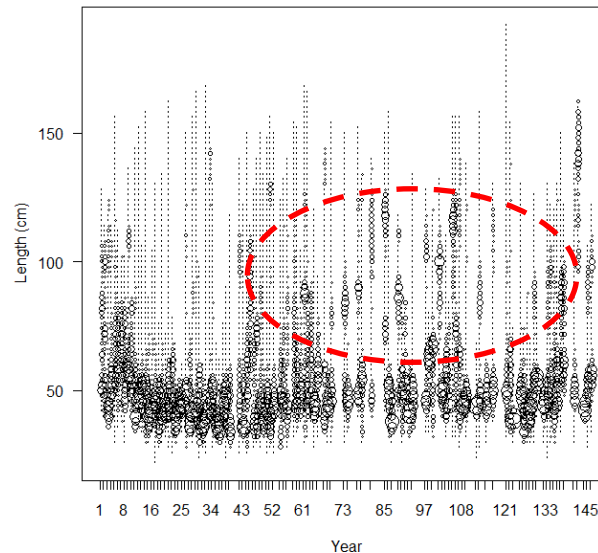


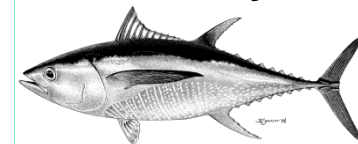
DOCUMENT YFT-01-06

AN EXPLORATION OF ALTERNATIVE METHODS TO DEAL WITH TIME-VARYING SELECTIVITY IN THE STOCK ASSESSMENT OF YELLOWFIN TUNA IN THE EASTERN PACIFIC OCEAN

Alexandre Aires-da-Silva and Mark Maunder

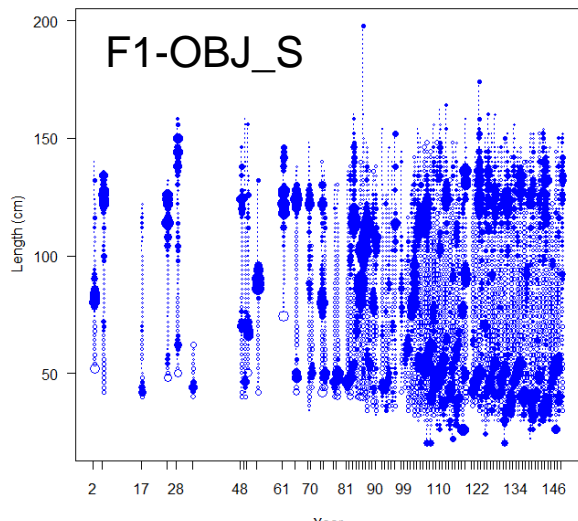
length comp data, sexes combined, whole catch, F3-OBJ_I (max=0.47)



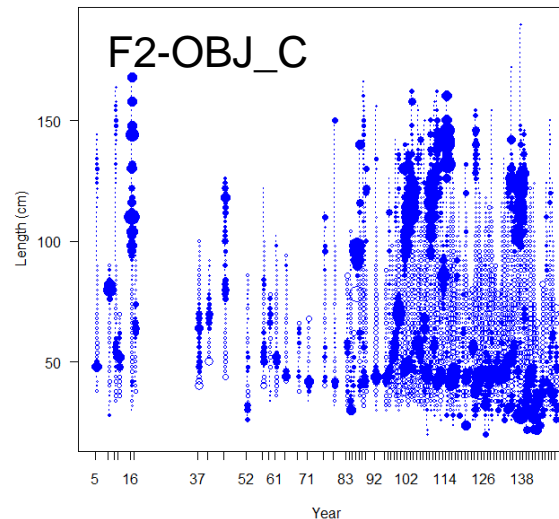


OBJ size comp. residual pattern

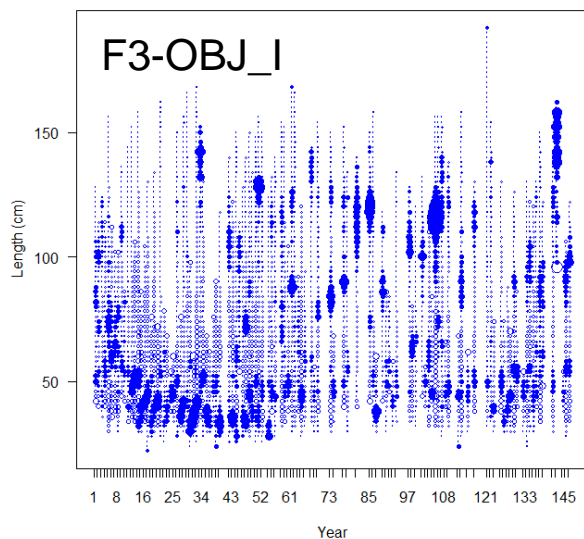
Pearson residuals, sexes combined, whole catch, F1-OBJ_S (max=5.2)



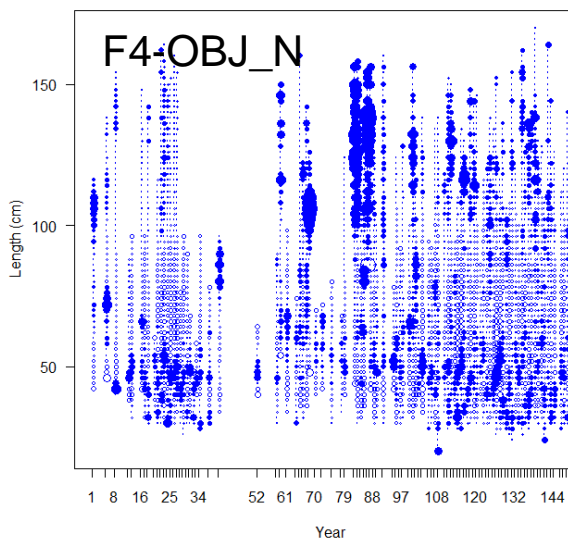
Pearson residuals, sexes combined, whole catch, F2-OBJ_C (max=5.46)



Pearson residuals, sexes combined, whole catch, F3-OBJ_I (max=12.18)

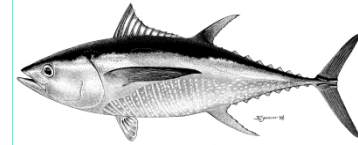


Pearson residuals, sexes combined, whole catch, F4-OBJ_N (max=7.61)



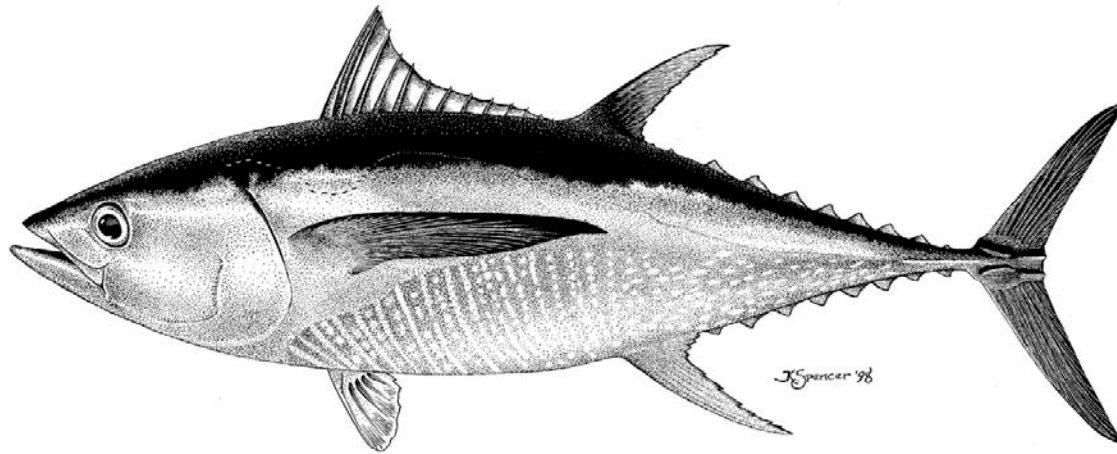
Numerical and convergence issues

Selectivity



- Unstable selectivities (OBJ)
 - Sensitive to initial parameter values and phases
 - Long run times (> 4 hours)
 - Issues inverting hessian matrix (steepness run)
- Faster and better convergence with R_0 estimated at later phase (may or not be related to selectivity)

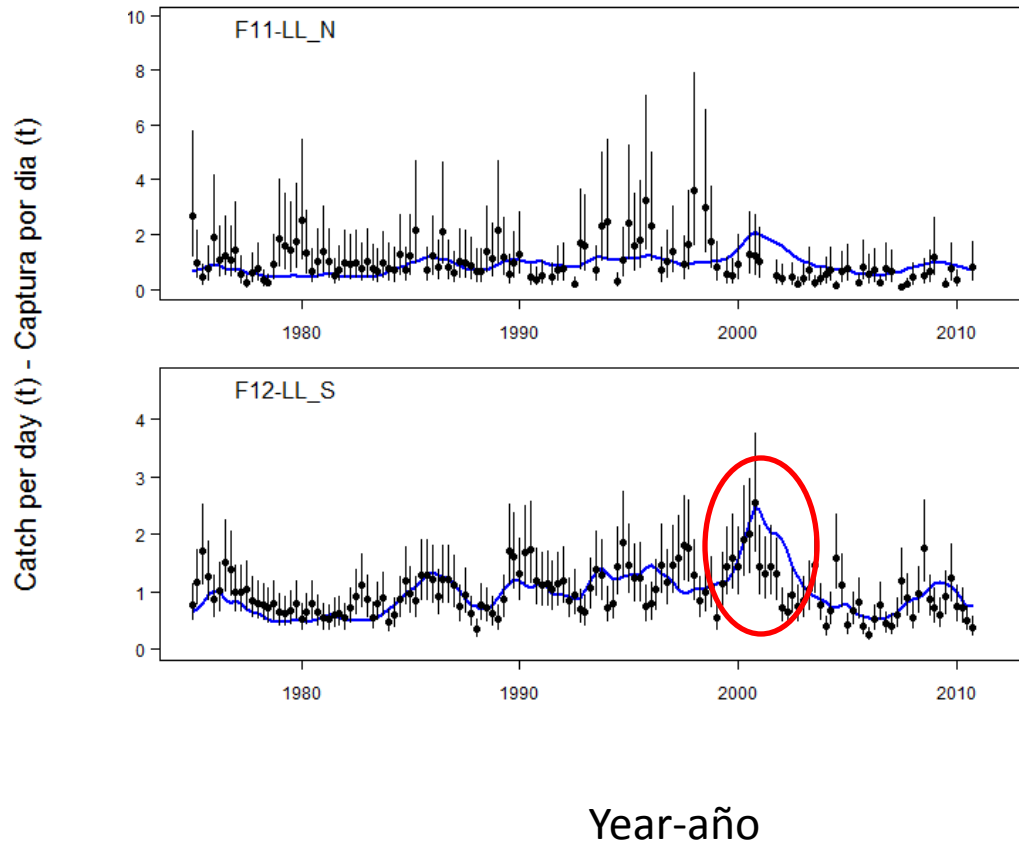
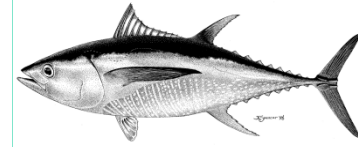




Data weighting

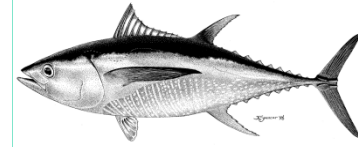
- Misfit to CPUE LL-S and DEL-N
- Higher effective sample sizes of the size-compositions

Fit to CPUE – LL fisheries

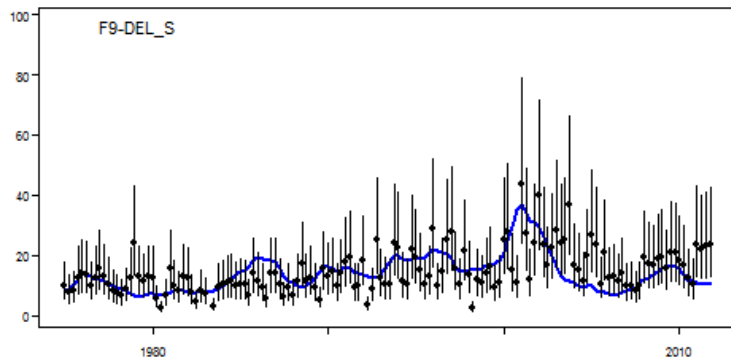
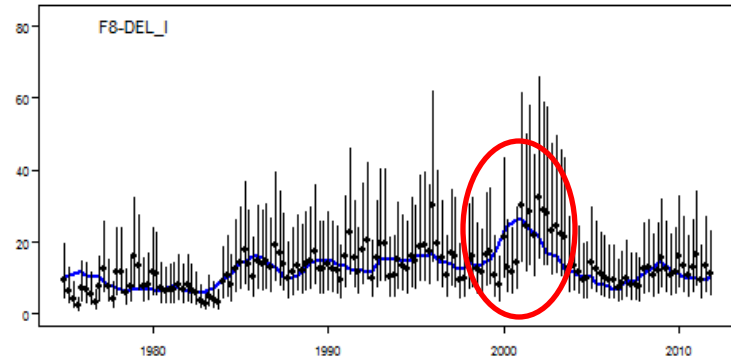
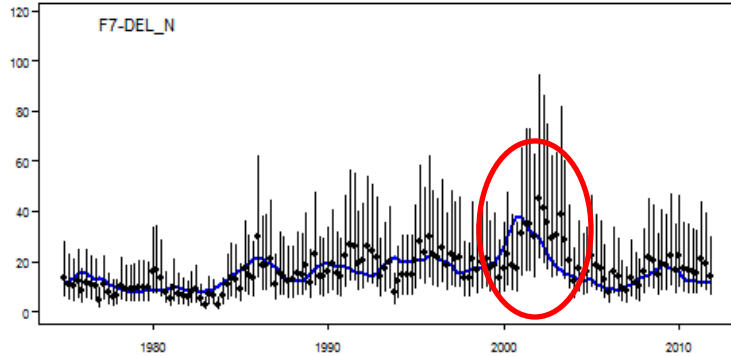


Fishery	r.m.s.e.	input	Used
F1-OBJ_S	0.35	estimated	No
F2-OBJ_C	0.41	estimated	No
F3-OBJ_I	0.69	estimated	No
F4-OBJ_N	0.41	estimated	No
F5-NOA_N	0.53	estimated	Yes
F6-NOA_S	0.64	estimated	Yes
F7-DEL_N	0.38	estimated	Yes
F8-DEL_I	0.37	estimated	Yes
F9-DEL_S	0.51	estimated	No
F11-LL_N	0.75	estimated	No
F12-LL_S	0.37	0.2 (FIXED)	Yes

Fit to CPUE – DEL fisheries



Catch per day (t) - Captura por día (t)

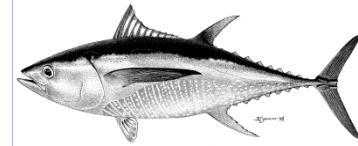


Year-año

Fishery	r.m.s.e.	input	Used
F1-OBJ_S	0.35	estimated	No
F2-OBJ_C	0.41	estimated	No
F3-OBJ_I	0.69	estimated	No
F4-OBJ_N	0.41	estimated	No
F5-NOA_N	0.53	estimated	Yes
F6-NOA_S	0.64	estimated	Yes
F7-DEL_N	0.38	estimated	Yes
F8-DEL_I	0.37	estimated	Yes
F9-DEL_S	0.51	estimated	No
F11-LL_N	0.75	estimated	No
F12-LL_S	0.37	0.2 (FIXED)	Yes

Iterative reweighting of LF

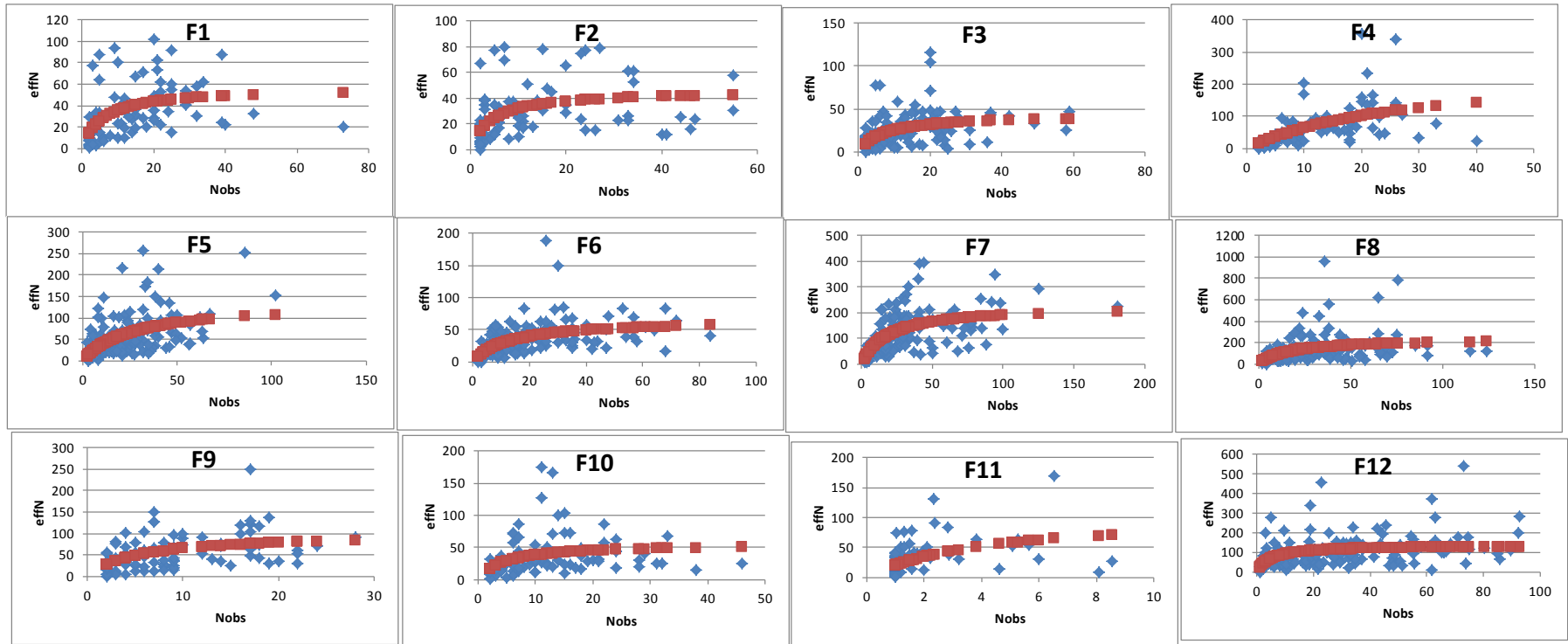
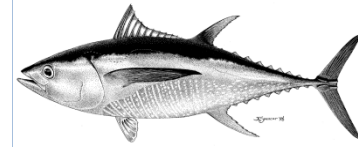
Sensitivities
(I. reweight)



Fishery	Mean input N	Mean effN	effN/N
F1-OBJ_S	14.3	33.0	2.3
F2-OBJ_C	13.5	28.6	2.1
F3-OBJ_I	13.2	23.9	1.8
F4-OBJ_N	10.9	57.7	5.3
F5-NOA_N	23.0	55.8	2.4
F6-NOA_S	20.5	34.2	1.7
F7-DEL_N	31.7	120.6	3.8
F8-DEL_I	29.6	130.5	4.4
F9-DEL_S	8.7	53.3	6.1
F10-BB	11.9	35.5	3.0
F11-LL_N	1.9	31.1	16.3
F12-LL_S	30.3	105.1	3.5

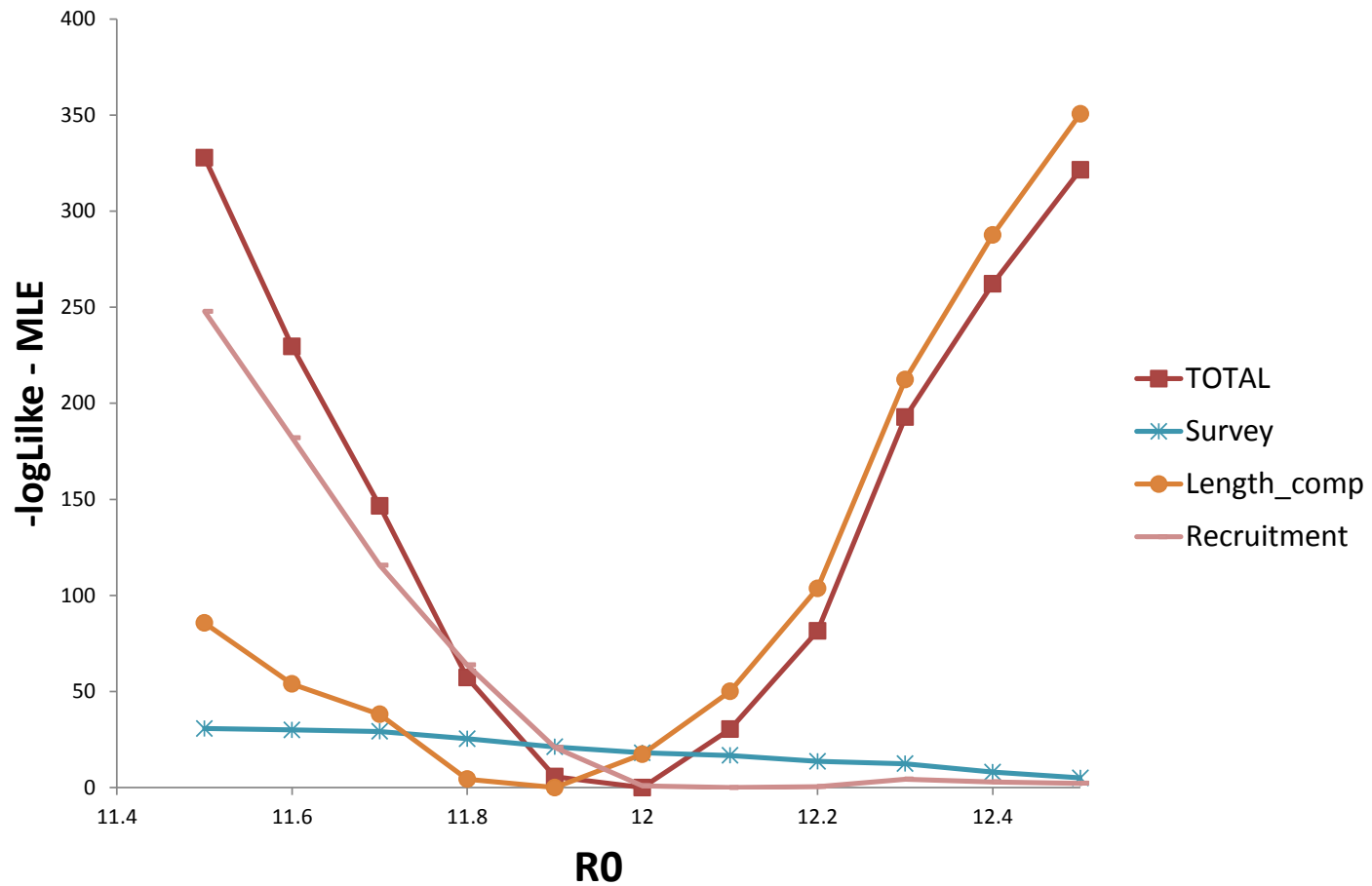
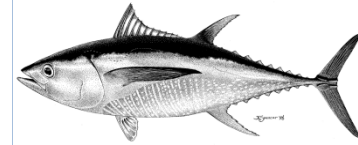
Iterative reweighting of LF

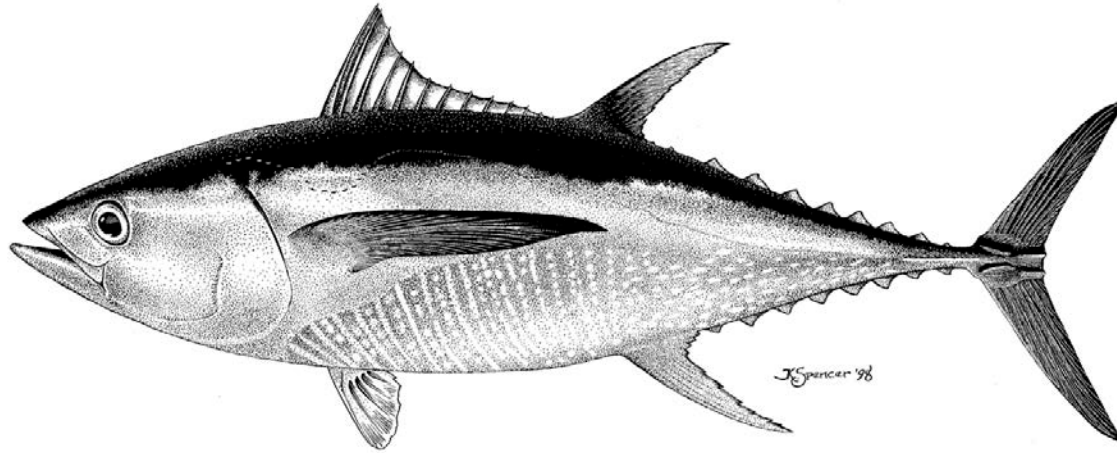
Sensitivities
(I. reweight)



Likelihood profile

Results - base case





Environmental regime shifts

Regime shifts

