Center of Independent Experts Review of BSAI yellowfin sole, northern rock sole and Alaska plaice

Alaska Fisheries Science Center
Seattle, Washington
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Terms of Reference

Evaluate the strengths and weaknesses of the assumptions made in applying the stock assessment model including how survey indices are scaled to the populations. Specifics might include:

How natural mortality estimates are estimated/applied

Assumptions about survey "catchability"

Application of fishery and survey age-specific schedules (maturity, body mass, selectivity)

The application (or lack thereof) of a stock-recruitment relationship (and associated parameter estimates)

Terms of Reference

Evaluate the stock assessment approach used focusing specifically on how fisheries and survey data are compiled and used to assess the stock status relative to stated management objectives under the Bering Sea and Aleutian Islands Fishery Management Plan (FMP) and the Magnuson-Stevens Act requirements. Elements should consider:

The FMP "Tier" designation

Fishing rate estimation relative to overfishing definitions

Stock status determinations relative to B_{MSY}

Recommend how assessment data and/or models could be improved.

Yellowfin sole

Natural Mortality

Examine a sex-specific M (even though fitting survey sex-ratio is not fitting the population sex ratio)

Explore the uncertainty in M

Might be interesting to examine age-specific M by addition of two Lorenzen type parameters

Yellowfin sole

Catchability (q)

Use new formulation of q that includes start date and interaction

Continue to do research on temperature and other factors and implement in the assessment. Also investigate free-floating q estimate.

Yellowfin sole

selectiviity and Stock Recruit fit

Check if patterns in fishery selectivity variation match patterns in growth variability.

Constant fishery selectivity model fits data well.

All 3 reviewers agreed the Ricker SR curve for 1978-2012 seems appropriate. However, Ricker model may fit data but not be realistic. State reason why Ricker model is used and why depensation occurs at high stock size relative to Bev-Holt.

All 3 reviewers agreed with the Tier 1a designation and that the stock is not overfished and overfishing is not occurring.

Northern rock sole

Natural Mortality

Recommend using model run with M estimated for both sexes (16.3) instead of fixed values for both sexes as in base model.

Explore the uncertainty in M

Fixing M at 0.15 is appropriate

Northern rock sole

Catchability (q)

No temperature-q relationship, best to leave q fixed and estimate M.

Explore rationale to use q=1.5 instead of q=1.4

Explore free floating q (unconstrained)

Northern rock sole

selectivity and Stock Recruit fit

Check if patterns in fishery selectivity variation match patterns in growth variability. Look at difference in weight at age versus length at age.

Modeling of fishery selectivity as annual varying and survey selectivity as a block seems appropriate.

SR fit: evidence of increased density dependence at high stock size. Ricker model fit may be a problem.

SR fit looks reasonable.

State reason why Ricker model is used and why depensation occurs at high stock size relative to Bev-Holt.

All 3 reviewers agreed with the Tier 1a designation and that the stock is not overfished and overfishing is not occurring.

Alaska plaice

Natural mortality and catchability

M and q: vary one and fix the other. It is best to estimate these parameters if possible.

Agree with selection of fixed M. Value of q is from herding experiment which is good to use because there is no temperature-q relationship.

Try to estimate q, if possible.

Alaska plaice

Selectivity and Tier Designation

Large difference between survey and fishery selectivity. Explain difference in gears.

No spawner-recruit relationship, uses SPR, retrospective pattern good.

Overfishing not occurring. Model is robust and reasonable, reviewers agree with assessment.

Other Comments

"Issues raised in the review regarding methods and alternative approaches are inconsequential in terms of the status determination"

"Specifying yellowfin sole as Tier 1 implies that we know more about the S-R relationship than we really do. But in terms of current yellowfin sole status, it makes no practical difference"

"it occurs to the curmudgeon in me that a simple rule to replace the assessment (and a CIE review) by a management procedure would be to simply specify the ABC as 10% of the survey biomass estimate, which is not too different from the scientific advice!"

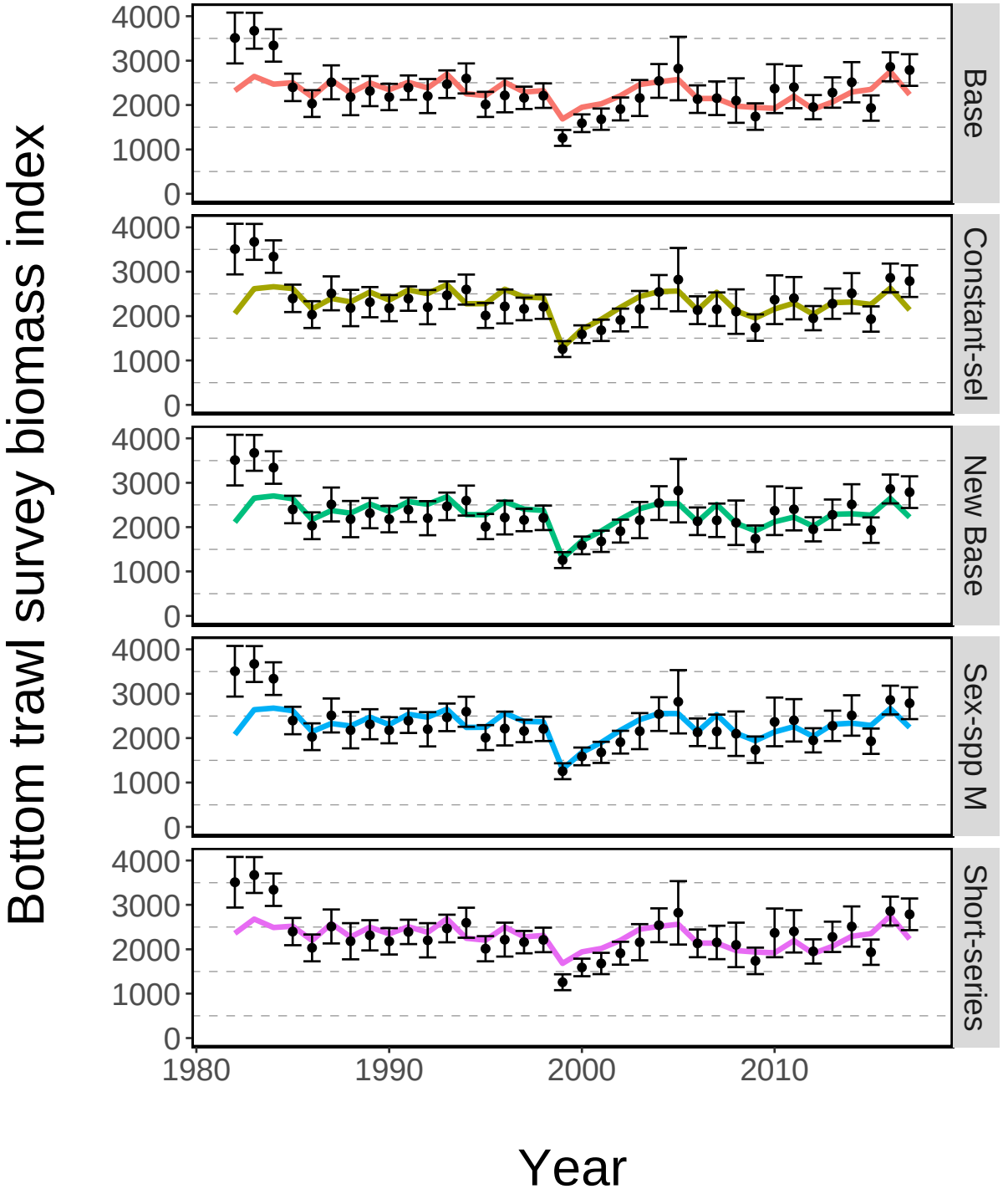
Summary of runs and requests for CIE review of EBS flatfish

For yellowfin sole

- Potential short-term requests:
  - Constant fishery selectivity
  - Start the model in 1982, ignore historical catches and other data
  - Examine sex-specific natural mortality
  - Time-varying selectivity for survey (if possible) and relationship w/ fishery.
- Longer term:
  - size-based selectivity and potential interactions with growth changes
  - Examine plus-group
  - Retrospective patterns with full model for survey catchability
  - Age-specific natural mortality (e.g., Lorenzen) might be considered (but since fishery ages mostly older, may not matter so much)

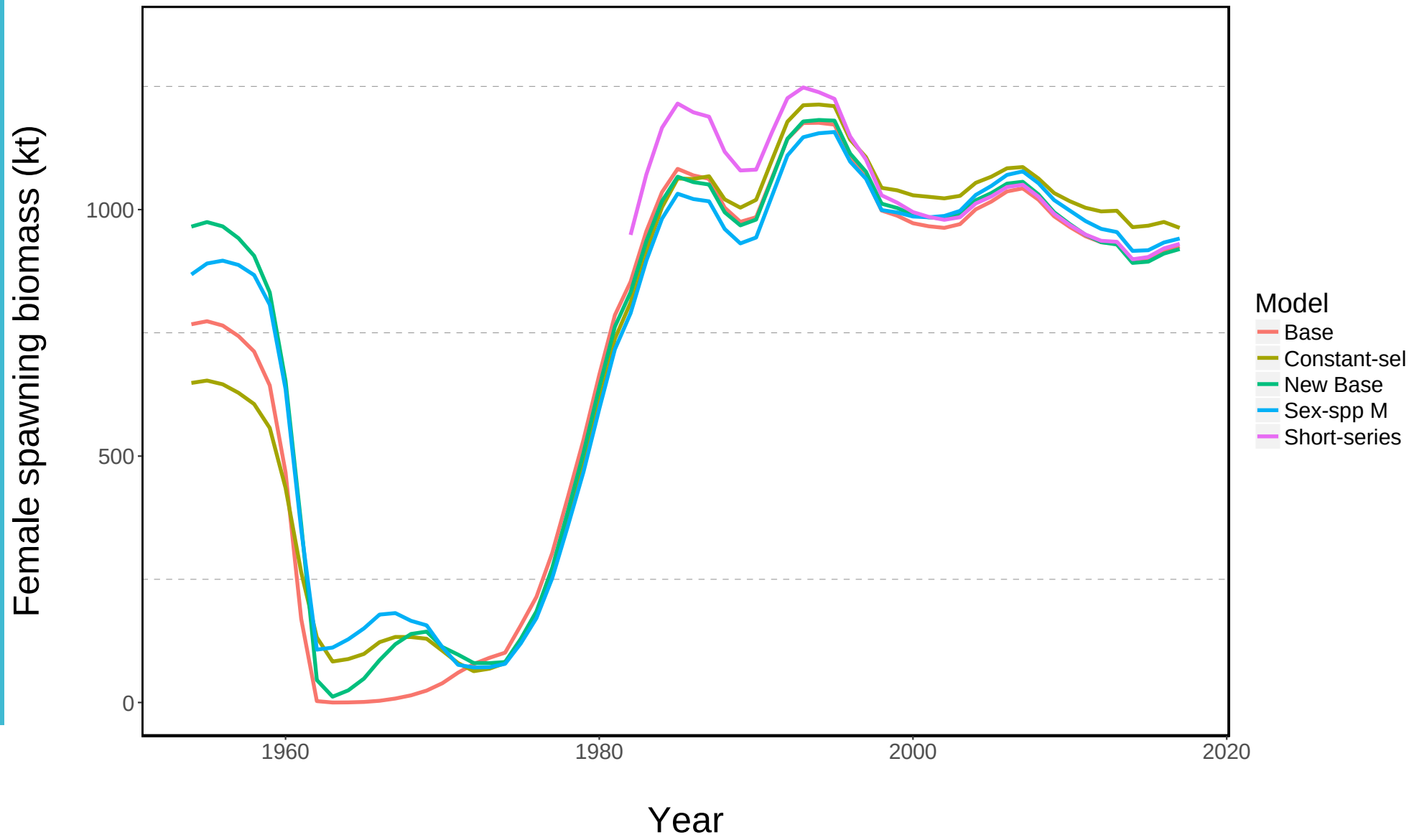
YFS Fits to survey

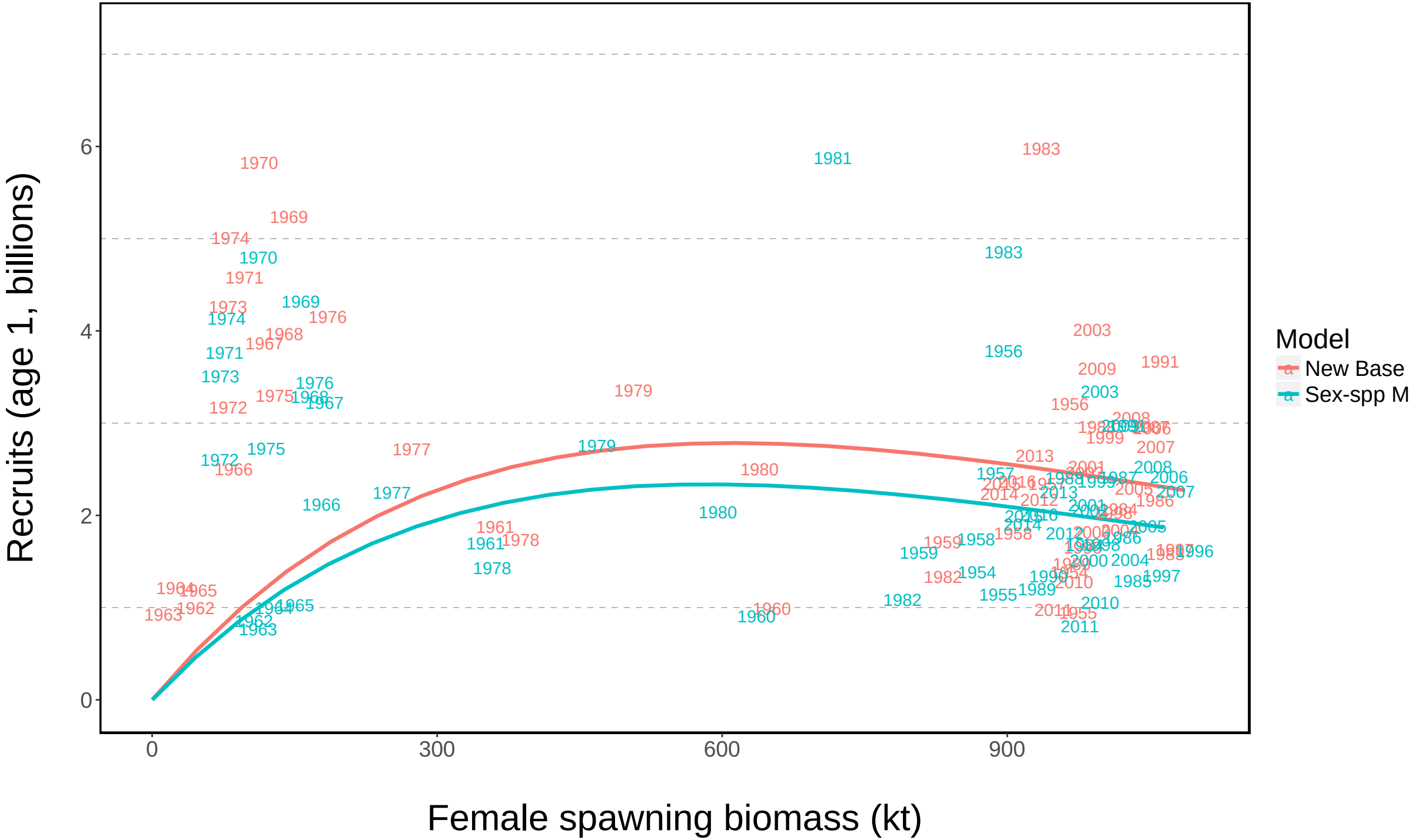
- For requested models

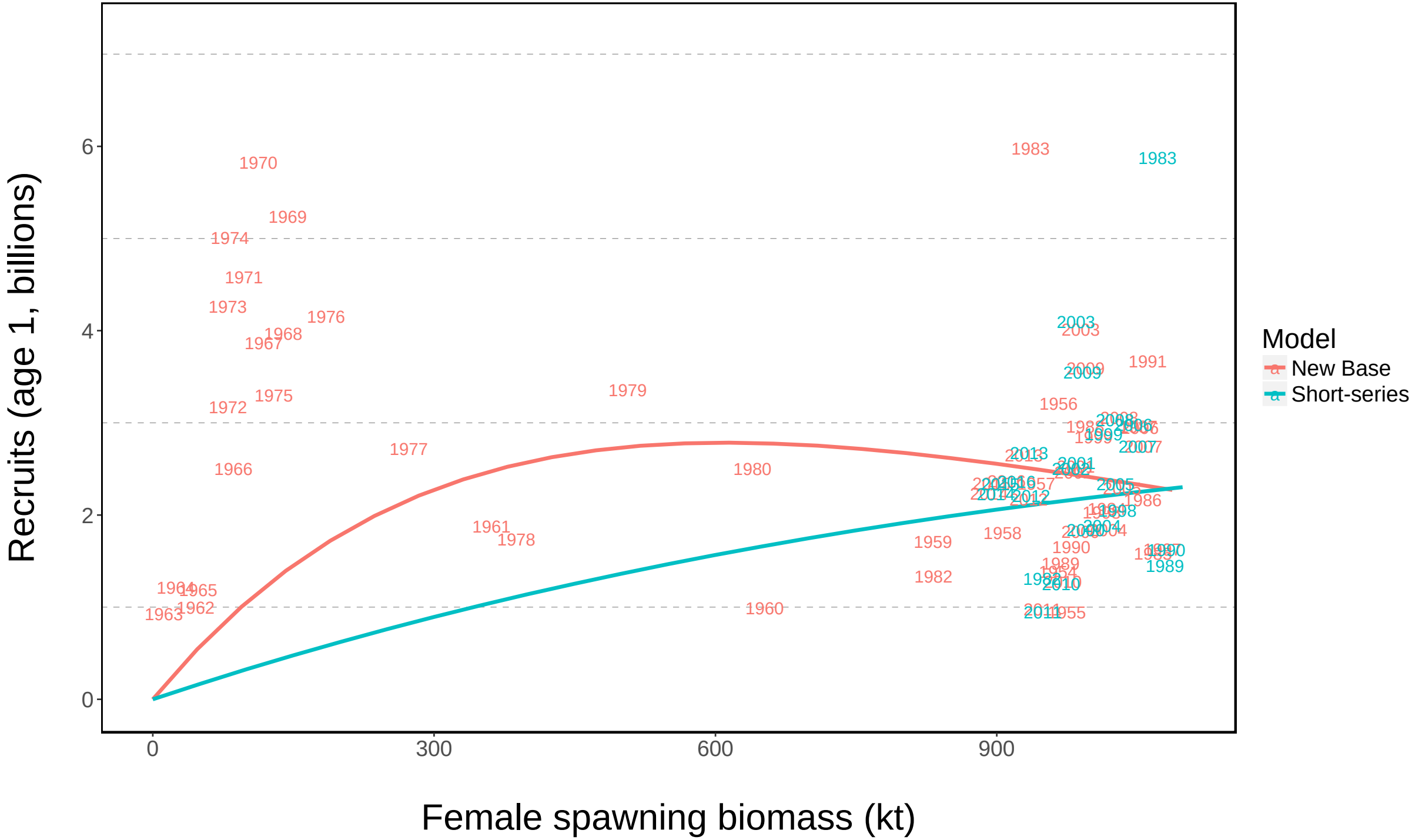


- For requested models

YFS Female spawning biomass estimates

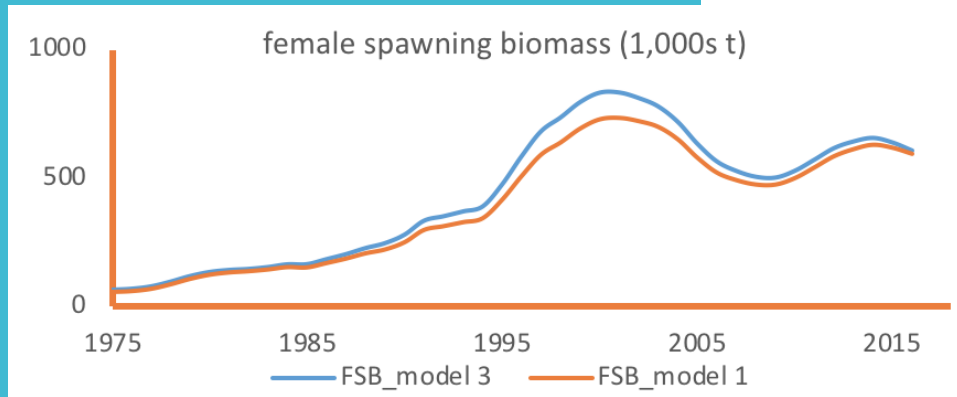


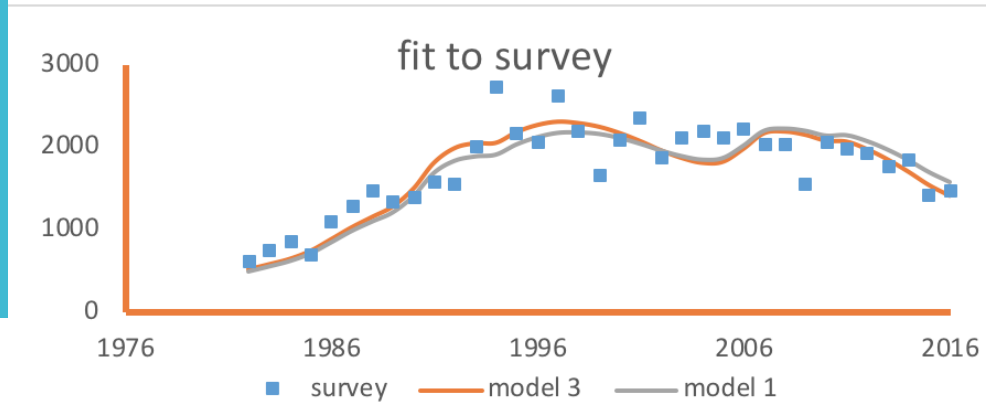

Recruits (age 1, billions)
0
2
4
6
0
300
600
900
Female spawning biomass (kt)
Model
New Base
Sex-spp M

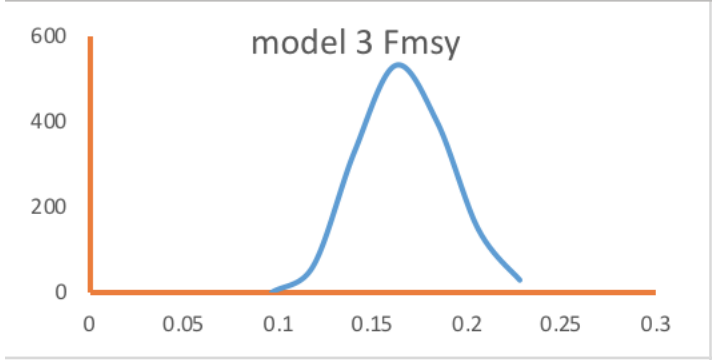

Recruits (age 1, billions)
Female spawning biomass (kt)
0
2
4
6
0
300
600
900
Model
New Base
Short-series

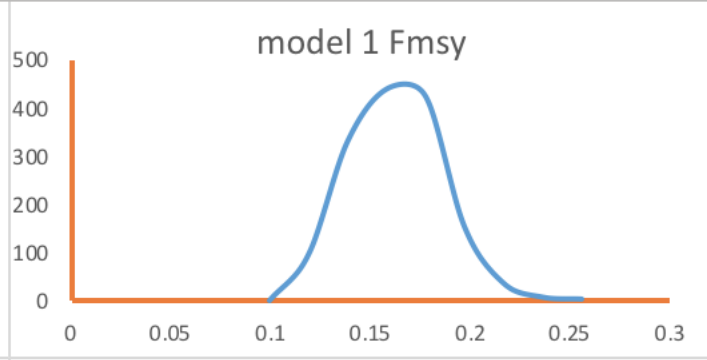
Rock sole

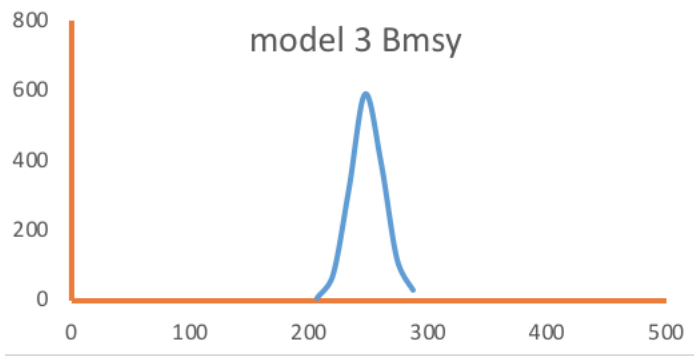
- Examine posterior marginal distributions of base model and model that estimates sex-specific natural mortality

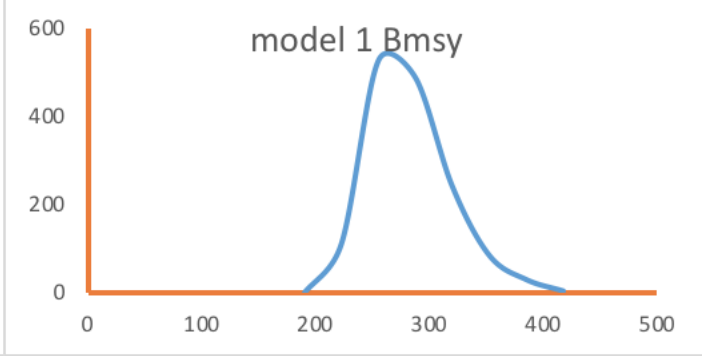

female spawning biomass (1,000s t)
1000
500
0
1975
1985
1995
2005
2015
FSB_model 3
FSB_model 1

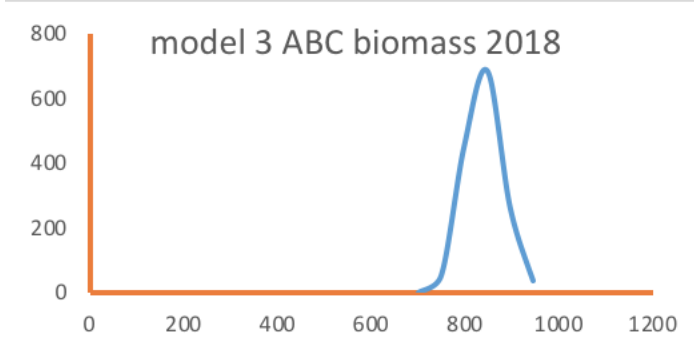

fit to survey
3000
2000
1000
0
1976
1986
1996
2006
2016
survey
model 3
model 1

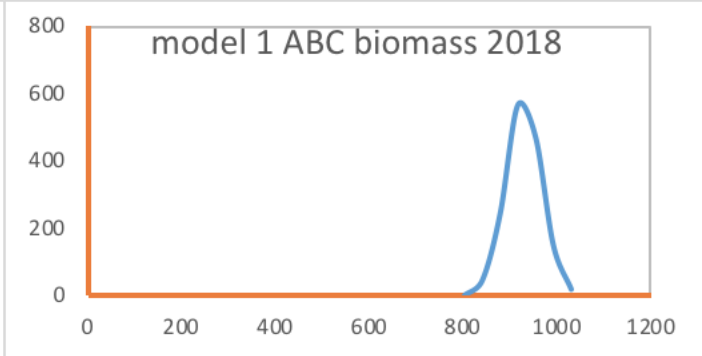

model 3 Fmsy
600
400
200
0
0
0.05
0.1
0.15
0.2
0.25
0.3

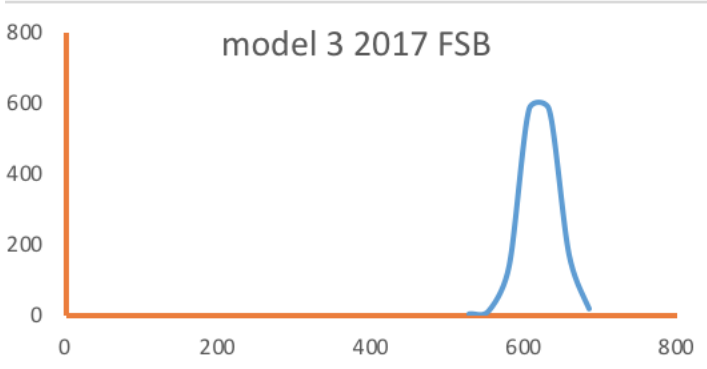

model 1 Fmsy
500
400
300
200
100
0
0
0.05
0.1
0.15
0.2
0.25
0.3

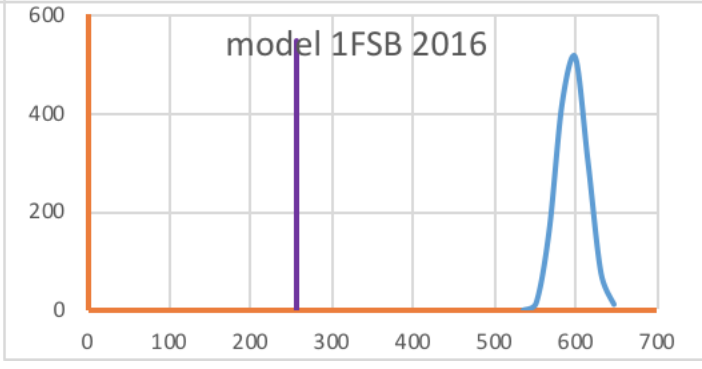

model 3 Bmsy
800
600
400
200
0
0
100
200
300
400
500


model 1 Bmsy
600
400
200
0
0
100
200
300
400
500


model 3 ABC biomass 2018
800
600
400
200
0
0
200
400
600
800
1000
1200


model 1 ABC biomass 2018
800
600
400
200
0
0
200
400
600
800
1000
1200


model 3 2017 FSB
800
600
400
200
0
0
200
400
600
800


model 1FSB 2016
600
400
200
0
0
100
200
300
400
500
600
700