

# Gulf of Mexico Penaeid Shrimp Stock Assessment Update 2016 Fishing Year

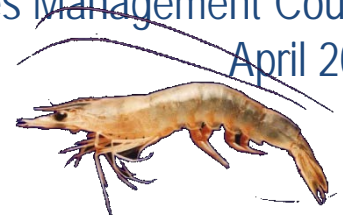


**NOAA  
FISHERIES**

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Gulf of Mexico Fisheries Management Council

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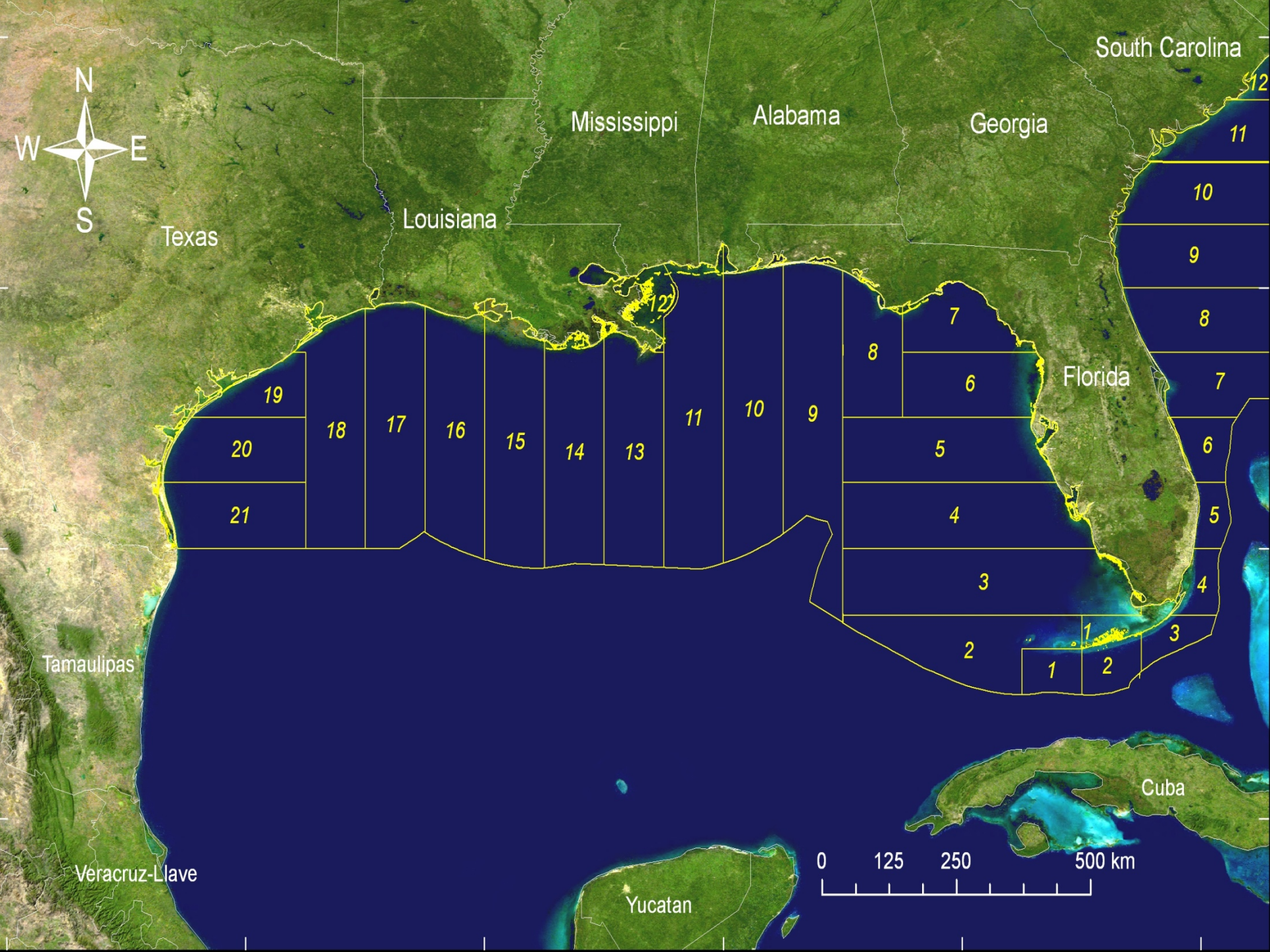


# Assessment Updates



Stock Synthesis stock assessment update for SSBmsy and Fmsy estimates for:

- Pink Shrimp statistical zones 1-11
- Brown Shrimp statistical zones 7-21
- White Shrimp statistical zones 7-21





# Pink Shrimp Model Inputs

- 1984-2016 GOM monthly catch (lbs. tails)
- 1984-2016 GOM monthly catch by size category
- 1984-2016 GOM monthly catch rate (CPUE)
- 1987-2016 SEAMAP Summer and Fall Survey Data
  - Catch by size
  - Nominal CPUE Index
- 2008-2016 SEAMAP Summer and Fall Survey Data
  - Delta lognormal CPUE Index

# Brown Shrimp Model Inputs

- 1984-2016 GOM monthly catch (lbs. tails)
- 1984-2016 GOM monthly catch by size category
- 1984-2016 GOM monthly catch rate (CPUE)
- 1984-2016 Louisiana monthly shrimp trawl surveys (Western subset)
  - Catch by size
  - Delta lognormal CPUE Index
- 1987-2016 SEAMAP Summer and Fall Survey Data
  - Catch by size
  - Delta lognormal CPUE Index

# White Shrimp Model Inputs

- 1984-2016 GOM monthly catch (lbs. tails)
- 1984-2016 GOM monthly catch by size category
- 1984-2016 GOM monthly catch rate (CPUE)
- 1984-2016 Louisiana monthly shrimp trawl surveys (Western subset)
  - Catch by size
  - Delta lognormal CPUE Index
- 1987-2016 SEAMAP Summer and Fall Survey Data
  - Catch by size
  - Delta lognormal CPUE Index

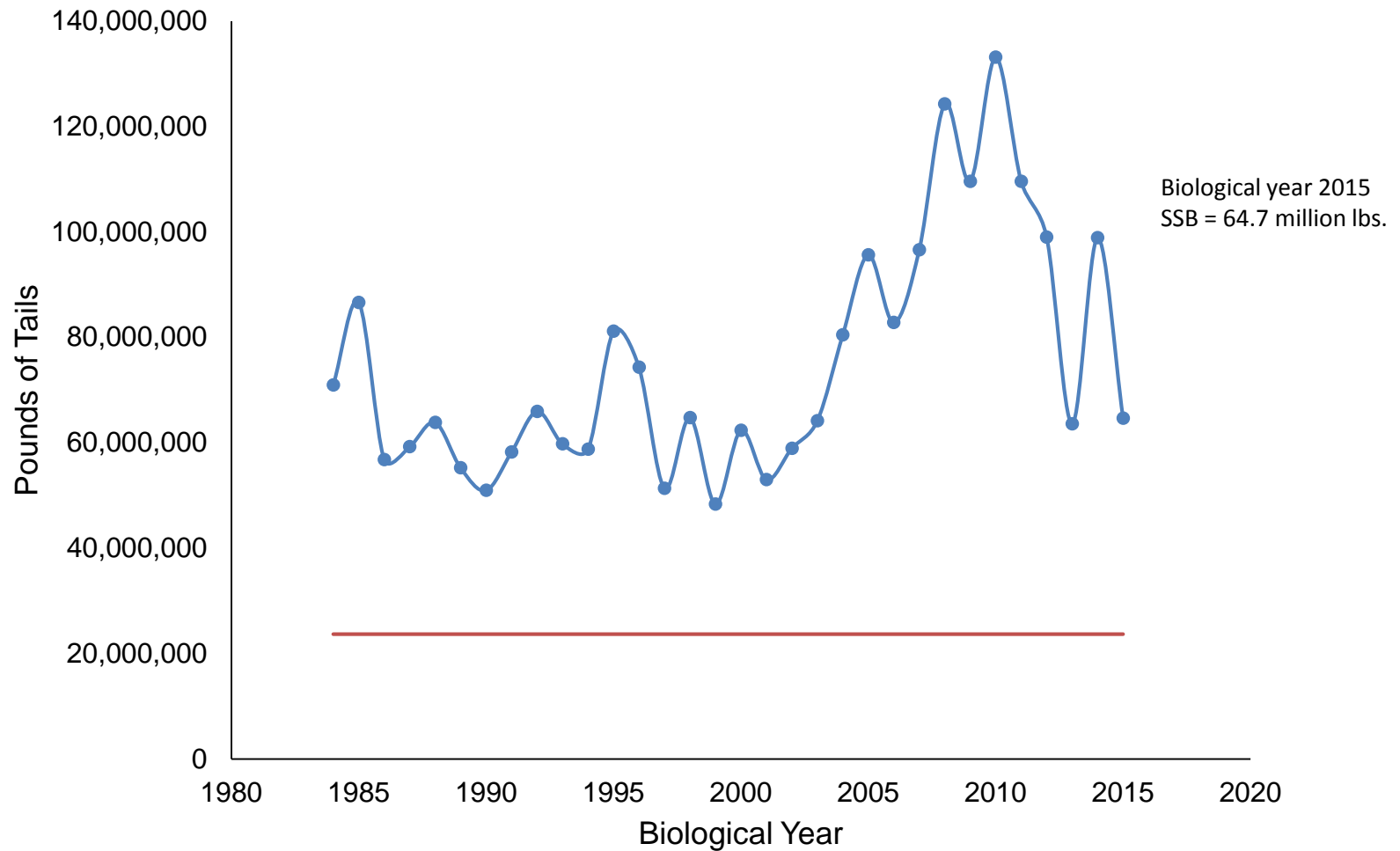
# Pink Shrimp $SSB_{msy}$ and $F_{msy}$ Reference Points

$SSB_{msy}$  - Pink shrimp spawn and recruit throughout the year. The current assessment method models these parameters on a continuous basis. Therefore we derive an annual  $SSB_{msy}$  by multiplying the terminal benchmark "year"  $SSB_{msy}$  estimate by 12.

This results in an annual  $SSB_{msy}$  of 23,686,465 lbs. (10,744.2 metric tons) of tails.

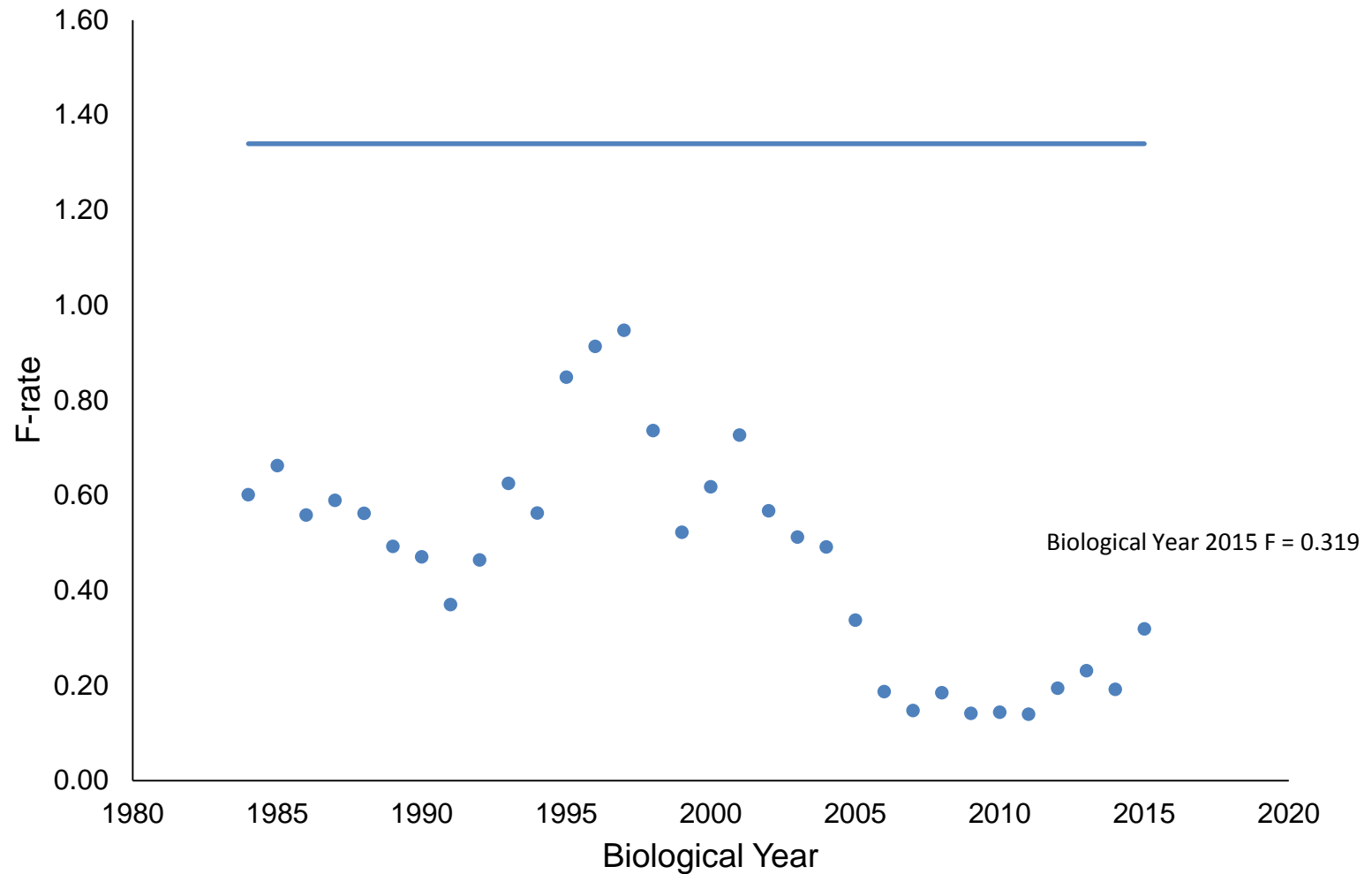
$F_{msy}$  - The SS model also estimates an  $F_{msy}$  value. The terminal benchmark "year" value is multiplied by 12 to estimate an annual  $F_{msy}$ . The sum of the monthly  $F_{std}$  estimates calculated in the annual assessment is compared to this  $F_{msy}$  estimate.

$$F_{msy}_{(annual)} = 1.35$$



Pink shrimp stock synthesis SSB and SSBmsy estimate, biological year 2015 (July 2015 – June 2016).





Pink shrimp stock synthesis annual  $F$  estimate, biological year 2015 (July 2015 – June 2016).

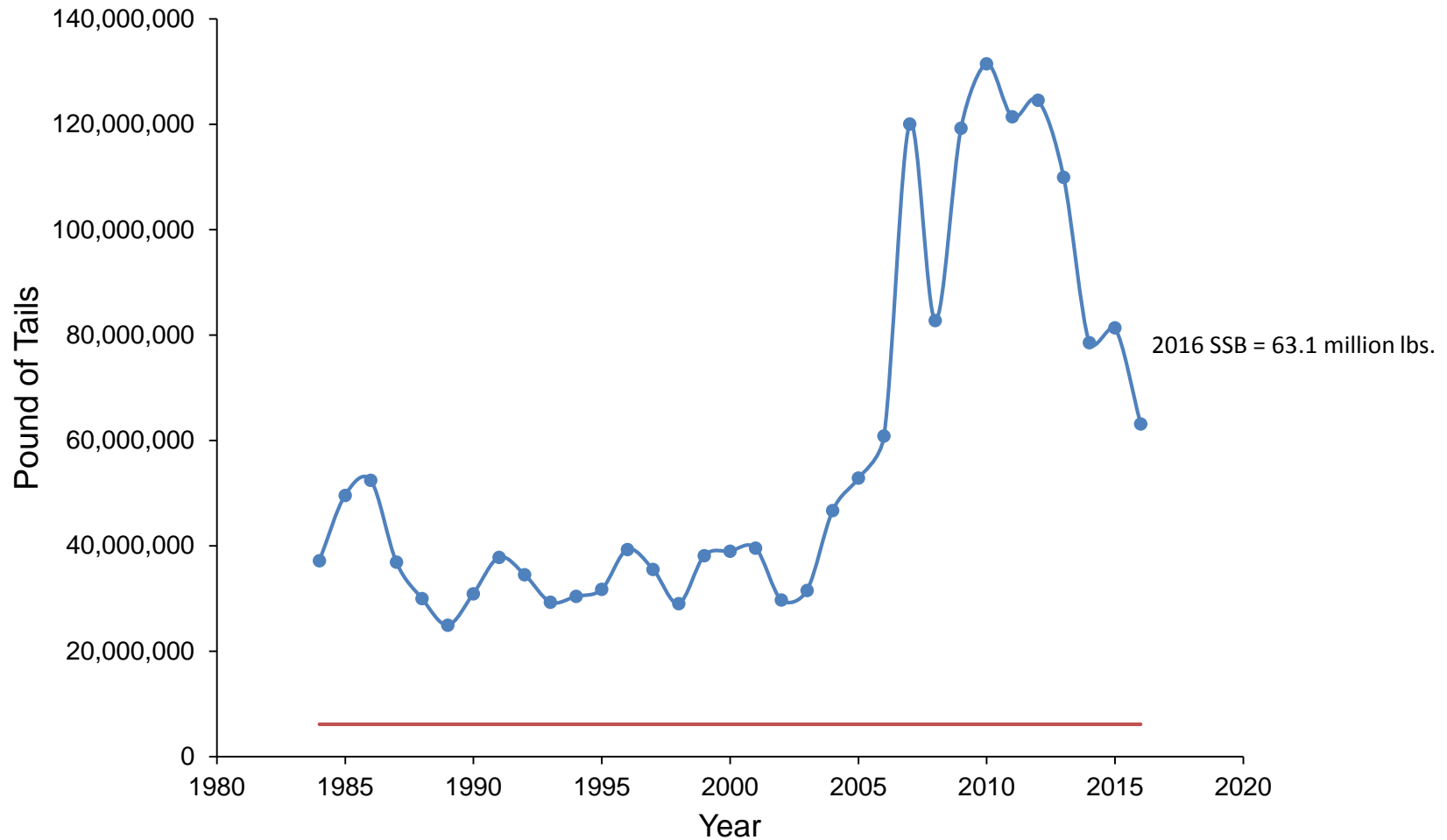
# Brown Shrimp $SSB_{msy}$ and $F_{msy}$ Reference Points

$SSB_{msy}$  - The brown shrimp stock assessment is parameterized as an annual model with seasons.

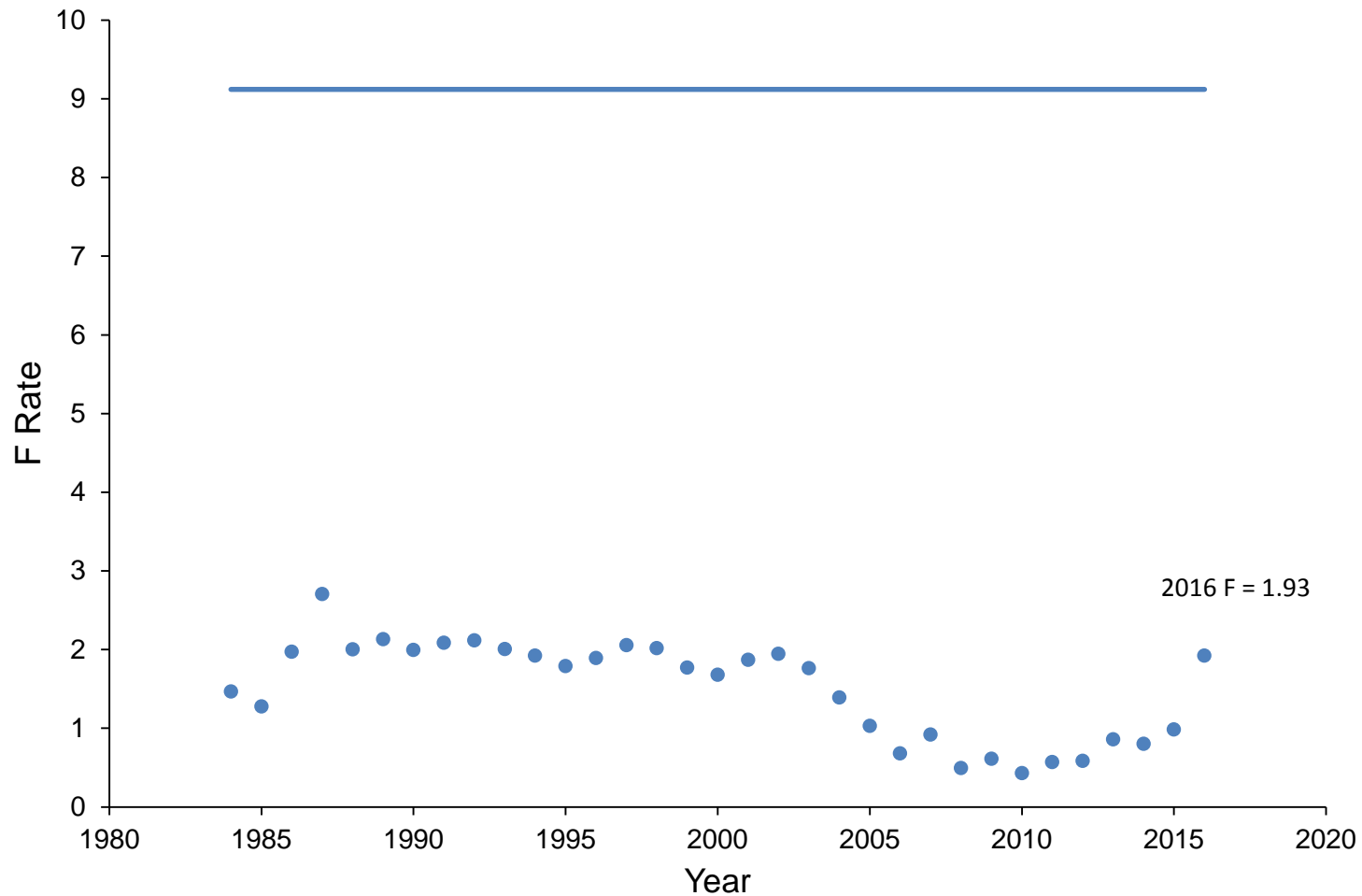
This results in an annual  $SSB_{msy}$  equal to 6,098,824 pounds of tails (2,766.4 metric tons).

$F_{msy}$  - SS calculates an annual  $F_{msy}$ . This is compared to the annual  $F_{std}$  estimated in the annual assessment run.

$$F_{msy(annual)} = 9.12$$



Brown shrimp 2016 stock synthesis annual SSB and SSBmsy estimates.



Brown shrimp 2016 stock synthesis annual F estimates.

# White Shrimp $SSB_{msy}$ and $F_{msy}$ Reference Points

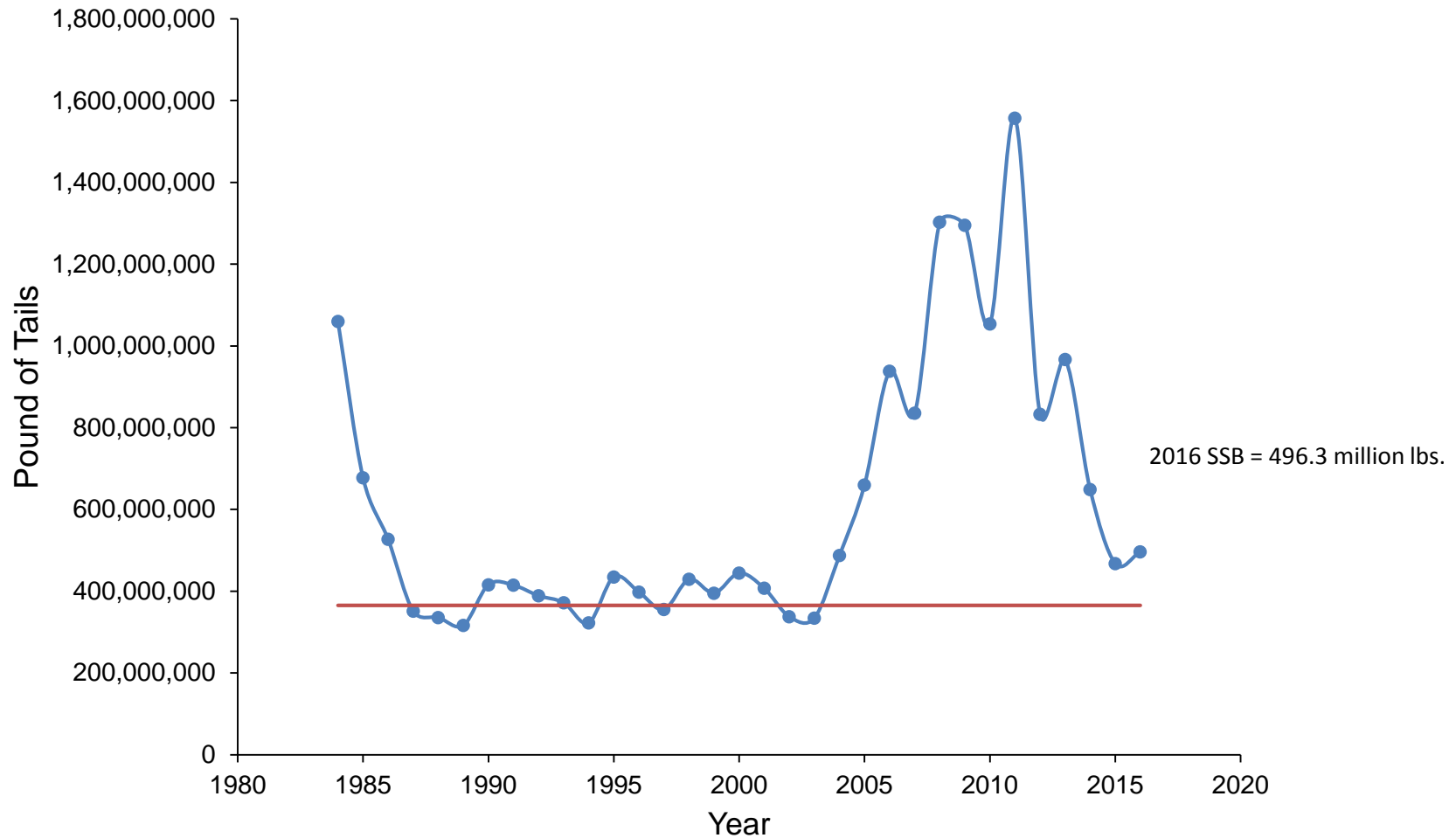
$SSB_{msy}$  - White shrimp spawn and recruit in cycles in throughout the year and similar to the pink shrimp model, this models these parameters on a continuous basis. An annual  $SSB_{msy}$  is estimated by multiplying the terminal benchmark "year"  $SSB_{msy}$  estimate by 12.

We derive an annual adjusted  $SSB_{msy}$  of 365,611,862 pounds of tails (165,885 metric tons).

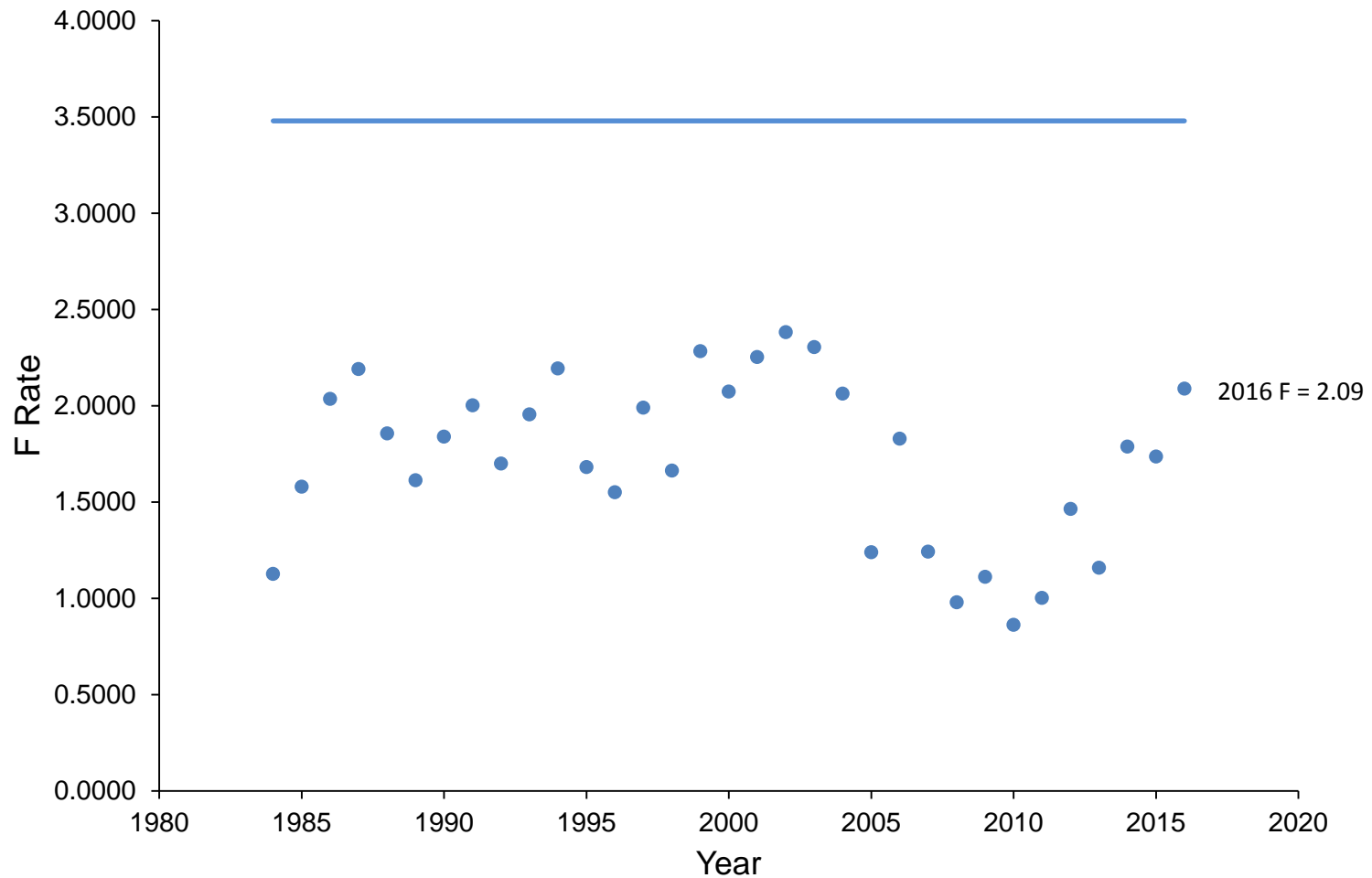
$F_{msy}$  - the SS model estimates an  $F_{msy}$  value. This value is multiplied by 12 to estimate an annual  $F_{msy}$ . The sum of the mean monthly  $F_{std}$  estimates is compared to this  $F_{msy}$  estimate.

$$F_{msy}_{(annual)} = 3.48$$





White shrimp 2016 stock synthesis annual SSB and SSBmsy estimates.



White shrimp 2016 stock synthesis annual F estimates.

# Conclusions

- All three stocks are healthy and are not Overfished nor undergoing Overfishing
- Spawning stock biomass for all three stocks is greater than overfished reference points
  - Pink = 64.7 million lbs.
  - Brown = 63.1 million lbs.
  - White = 496.3 million lbs.
- Fishing mortality rates are less than the F-rate overfishing reference points
  - Pink = 0.32
  - Brown = 1.93
  - White = 2.09

# Acknowledgements

Drs. Richard Methot

National Marine Fisheries Service

Assistance with Stock Synthesis modeling and SSBmsy and Fmsy estimation

James Primrose and Jo Williams

National Marine Fisheries Service

Assistance with data compilation and maps

Louisiana Wildlife and Fisheries – Joe West

GOM Commercial Shrimp Fishermen









Gulf of Mexico Pink Shrimp Stock Assessment Forecast Output File					
Model Run, Rick A. Hart, NMFS SEFSC Galveston Laboratory					
#V3.24a					
SS-V3.24a-safe;_02/24/2012;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_10					
Thu	Aug	14	14:43:10	2014	
Calculate_FMSY	Value			Annual Calculations	
SPR	0.23598				
Fmult	0.60304				
F_std	0.112206				1.346472
Exploit(Y/Bsmry)	0.319483				
Recruits@MSY	382004	--	--	382004	0.874834
SPBio	895.35	0.002344	--		10744.2
SPBmsy/SPBzero(using_SPB_virgin)	0.206443	--	--		
SPBmsy/SPBzero(using_BenchmarkYr_biology)	0.206443	--	--		
MSY_for_optimize	655.635	0.001716	--		
MSY_encountered	655.635	0.001716	--		
MSY_dead	655.635	0.001716	--	77634.7	
MSY_retain	655.635	0.001716	--		
Biomass_Smry	2052.17	0.005372	--		

Pink shrimp stock synthesis annual SSBmsy and Fmsy estimates.

Gulf of Mexico Brown Shrimp Stock Assessment Forecast Output File					
Model Run, Rick A. Hart, NMFS SEFSC Galveston Laboratory					
#V3.24a					
SS-V3.24a-safe;_02/24/2012;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_10					
Mon	Aug	25	11:17:07	2014	
calculate_FMSY	Value				
SPR	0.0565764				
Fmult	109.395				
F_std	9.11625				
Exploit(Y/Bsmry)	13.8838				
Recruits@MSY	3.98E+07	--	--	3.98E+07	0.999852
SPBio	2766.38	6.95E-05	--	Spawning biomass at MSY	
SPBmsy/SPBzero(using_SPB_virgin)	0.0618594	--	--		
SPBmsy/SPBzero(using_BenchmarkYr_biology)	0.056568	--	--		
MSY_for_optimize	66643.2	0.00167366	--		
MSY_encountered	0	0	--		
MSY_dead	66643.2	0.00167366	--	1.58E+07	
MSY_retain	66643.2	0.00167366	--		
Biomass_Smry	4800.07	0.000120548	--		

Brown shrimp stock synthesis annual SSBmsy calculations.

#V3.24a									
SS-V3.24a-safe;_02/24/2012;_Stock_Synthesis_by_Richard_Methot_(NOAA)_using_ADMB_10									
Wed	Sep	17	11:15:17	2014					
Calculated_Max_Allowable_F	3.25438								
calculate_FMSY	Value			Annual Value					
SPR	0.169578								
Fmult	0.535717								
F_std	0.290407			3.484884					
Exploit(Y/Bsmry)	0.188141								
Recruits@MSY	2.22E+06	--	--	This would be annualized spawning biomass at MSY					
SPBio	13823.8	0.006224	--	165885.6					
SPBmsy/SPBzero(using_SPB_virgin)	0.167476	--	--						
SPBmsy/SPBzero(using_BenchmarkYr_biology)	0.167475	--	--						
MSY_for_optimize	3380.67	0.001522	--						
MSY_encountered	0	0	--						
MSY_dead	3380.67	0.001522	--	879826					
MSY_retain	3380.67	0.001522	--						
Biomass_Smry	17968.8	0.008091	--						

White shrimp Stock Synthesis SSBmsy and Fmsy calculations.