

Gulf of Alaska Shallow-water flatfish

Changes

- Data
 - Catch data updated for 2015 and added for 2016 and to October 1`, 2017.
 - Addition of 2017 survey data
- Assessment
 - Current biomass, splits in ABC by area and species determined using the random effects model.

Current Biomass and ABC splits - Random effects model

- 1. Random effects model run on survey biomass for sum of species excluding rock sole. Rock sole current biomass from the rock sole model.
- 2. Random effects model run by area using survey biomass for all species (including rock sole) to get area split for ABC.
- 3. Random effects model run by species (excluding rock sole) to get split in ABC by species.

Tier 5 except rock sole Tier 3a.

- OFL Biomass $\times F$, where $F=M=0.2$ all species except Rock sole
- ABC Biomass $\times 0.75 \times F$ all species except Rock sole

GOA shallow-water flatfish catch was 2,369 t in 2017 (to October 1), lower than the ABC of 44,514 t.

Stock/ Assemblage	Area	2017 OFL¹	ABC¹	TAC¹	Catch²	2018 OFL	ABC	2019 OFL	ABC
Shallow water flatfish	W	--	20,921	13,250	259	--	25,206	--	25,54
	C	--	19,306	19,306	2,109	--	25,315	--	25,65
	WYAK	--	3,188	3,188	<1	--	2,242	--	2,27
	SEO	--	1,099	1,099	<1	--	1,925	--	1,95
	Total	54,583	44,514	36,843	2,369	67,240	54,688	68,114	55,422

Biomass, OFL and ABC increased from last assessment due to increases in biomass and F35% for rock sole and an increase in biomass estimated for other species in the shallow-water complex

Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2017	2018	2018	2019
M (natural mortality rate) ¹	0.2	0.2	0.2	0.2
Tier	3a and 5	3a and 5	3a and 5	3a and 5
Biomass (t)	299,858	301,047	339,152	343,018
F_{OFL}	*	*	*	*
$maxF_{ABC}$	*	*	*	*
F_{ABC}	*	*	*	*
OFL (t)	54,583	54,893	67,240	68,114
maxABC (t)	44,514	44,770	54,688	55,422
ABC (t)	44,514	44,770	54,688	55,422
Status	As determined <i>this year for:</i>			
	2015	2016	2016	2017
Overfishing	No	NA	No	NA

Catch has been declining, however is low compared to ABC. Catch in 2015 was 3,358 t in 2016 3,807 t and 2,369 t to October 1, 2017.

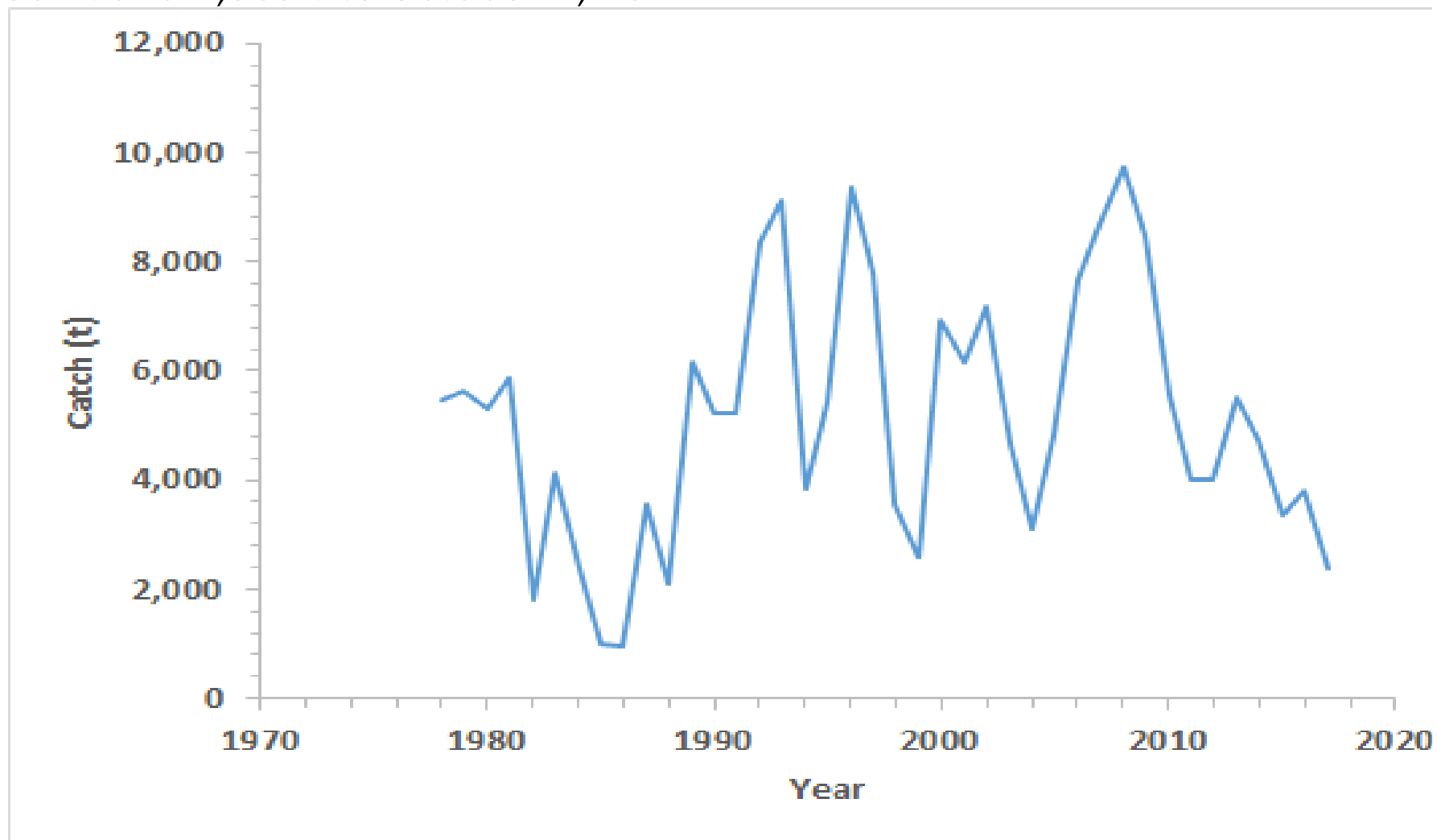


Figure 4.1. Catch (t) of shallow-water flatfish from 1978 to October 1, 2017.

The likelihood equation for the random effects model is,

$$\sum_{i=1}^{yrs} \left\{ 0.5 \left(\log(2\pi\sigma_i^2) + \left(\frac{(\hat{B}_i - B_i)^2}{\sigma_i^2} \right) \right) \right\} + \sum_{t=2}^{yrs} \left\{ 0.5 \left(\log(2\pi\sigma_p^2) + \left(\frac{(\hat{B}_t - \hat{B}_{t-1})^2}{\sigma_p^2} \right) \right) \right\}$$

Where,

B_i is the log of observed biomass in year i,

$\hat{B}_i$ is the model estimated log biomass in year t,

σ_i^2 is the variance of observed log biomass in year i,

σ_p^2 is the variance of the deviations in log survey biomass between years (i.e. process error variance), σ_p^2 was estimated as $e^{(2\lambda)}$, where λ is a parameter estimated in the random effects model and,

Yrs is the number of years of survey biomass values.

Random effects models

- There were 11 random models fit to the shallow-water flatfish survey data.
- 4 models for the area fits for all species including rock sole for the area apportionments
- 6 models for the fits by species to split the ABC by species for comparison to catch
- 1 model for the fit to all species excluding rock sole to get 2017 biomass

GOA shallow-water flatfish biomass (excluding rock sole) increased from 2015 to 2017. Estimated biomass of rock sole from the assessment model increased as well.

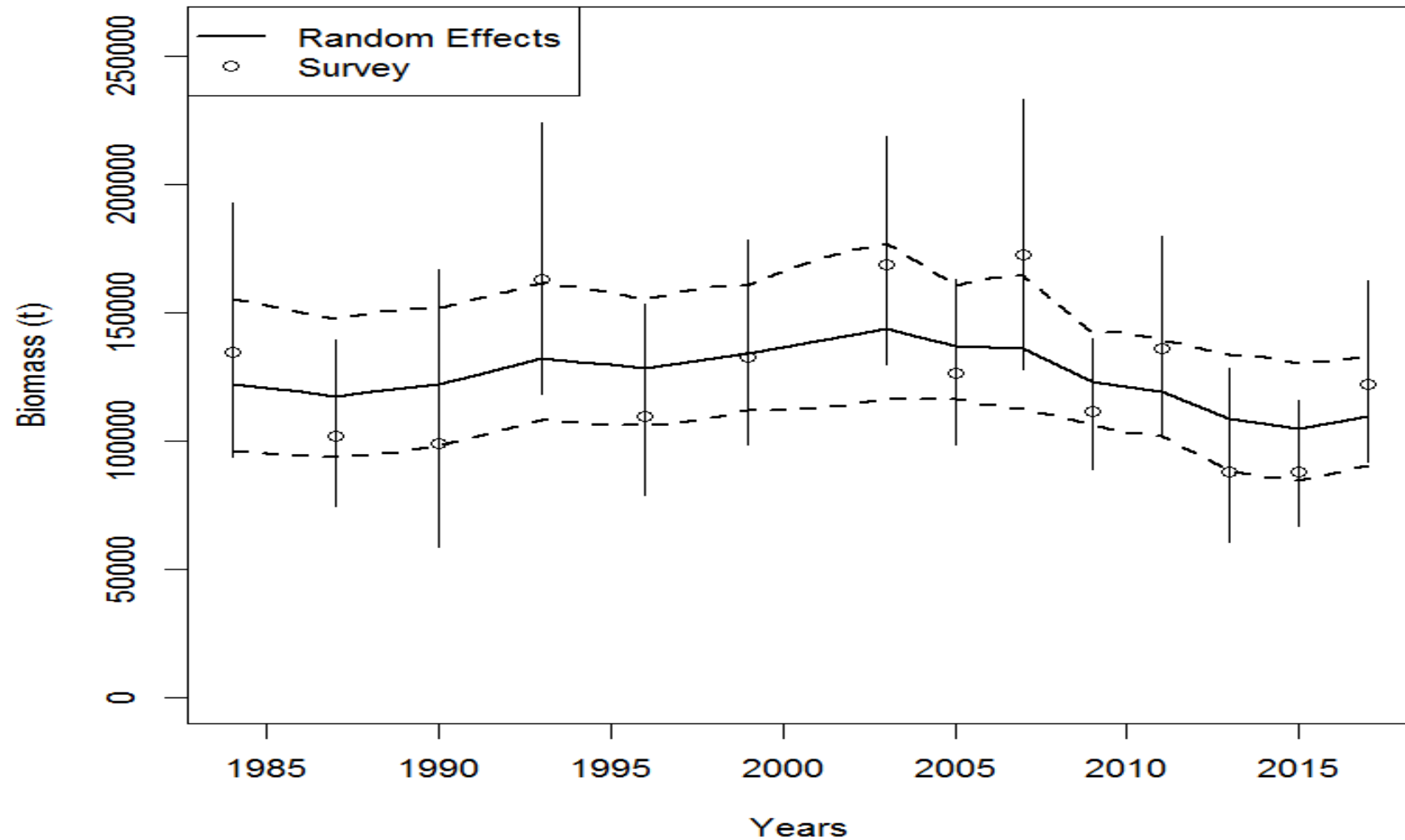


Figure 4.8. Fit of random effects model to shallow-water flatfish survey biomass 1984 to 2017 (excluding Rock sole). Dashed lines are 95% CI.

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	2016	2016	
Species	Catch	ABC	OFL
Rock sole	3,009	31,000	36,700
Yellowfin sole	<1	4,150	5,533
Butter sole	500	2,133	2,844
Starry flounder	62	3,597	4,796
English sole	35	2,438	3,251
Sand sole	<1	96	129
Alaska plaice	3	950	1,267
Total	3,608	44,364	54,520

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	2017	2018	2018	2019
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Tier	3a and 5	3a and 5	3a and 5	3a and 5
Biomass (t)	299,858	301,047	339,152	343,018
F_{OFL}	*	*	*	*
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F_{ABC}	*	*	*	*
OFL (t)	54,583	54,893	67,240	68,114
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Overfishing	No	NA	No	NA