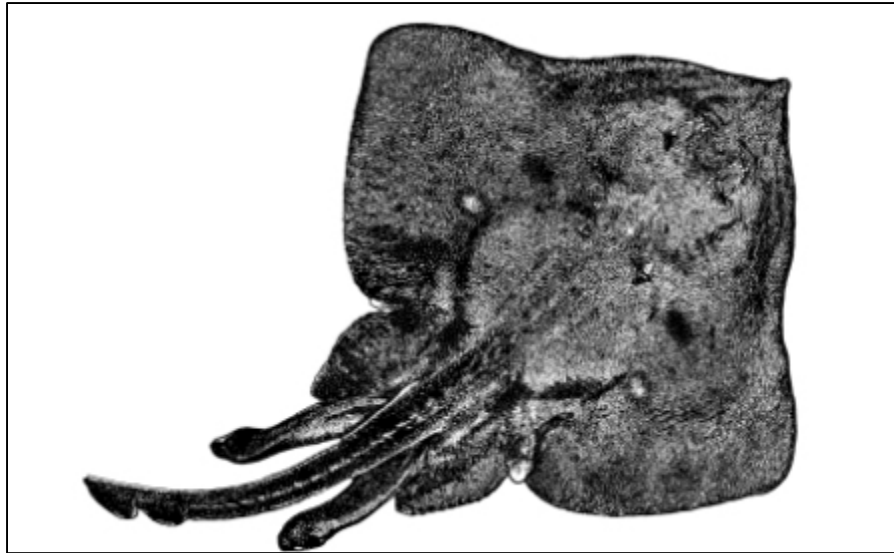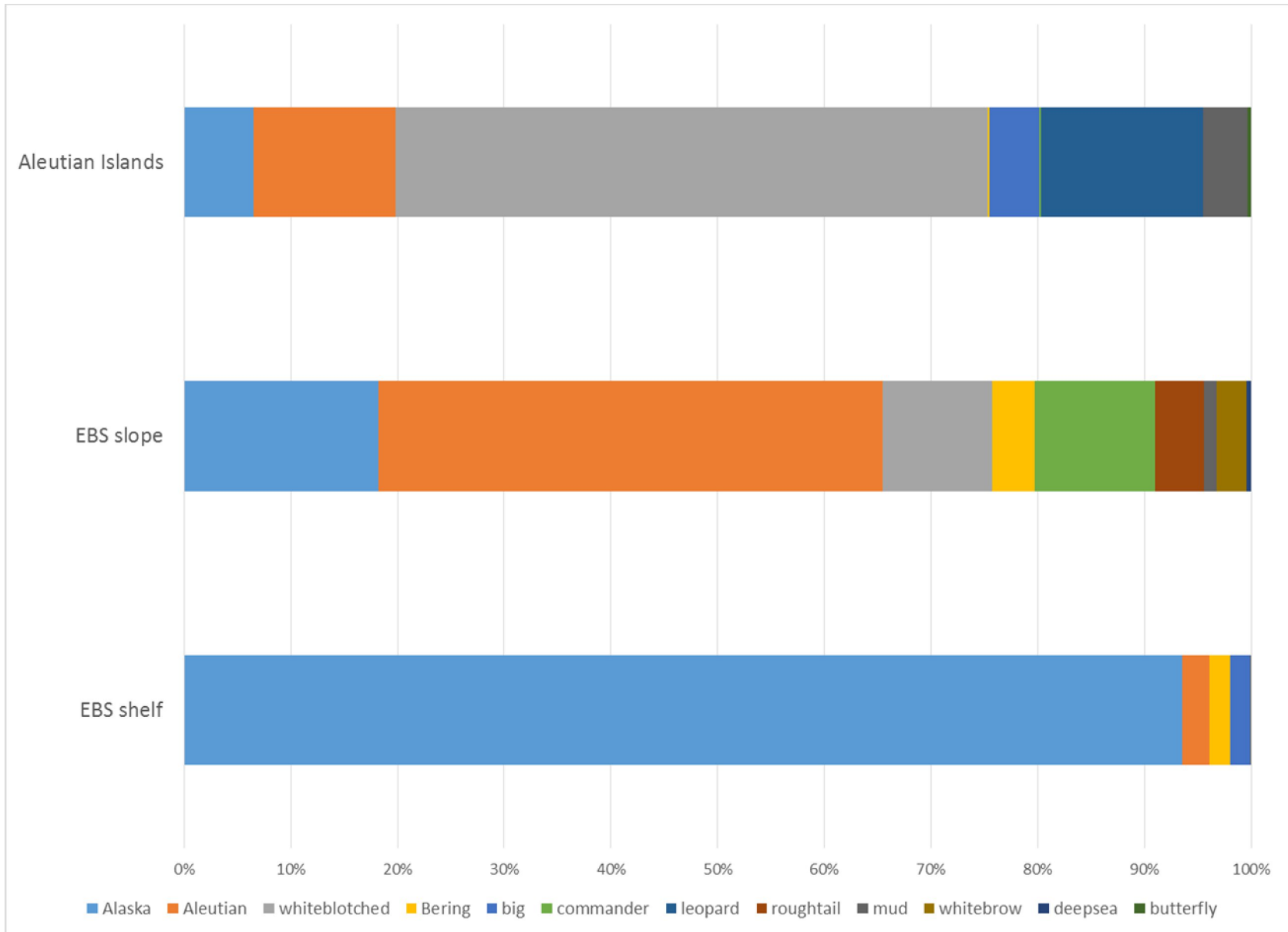# BSAI skate complex

Olav A. Ormseth
Alaska Fisheries Science Center
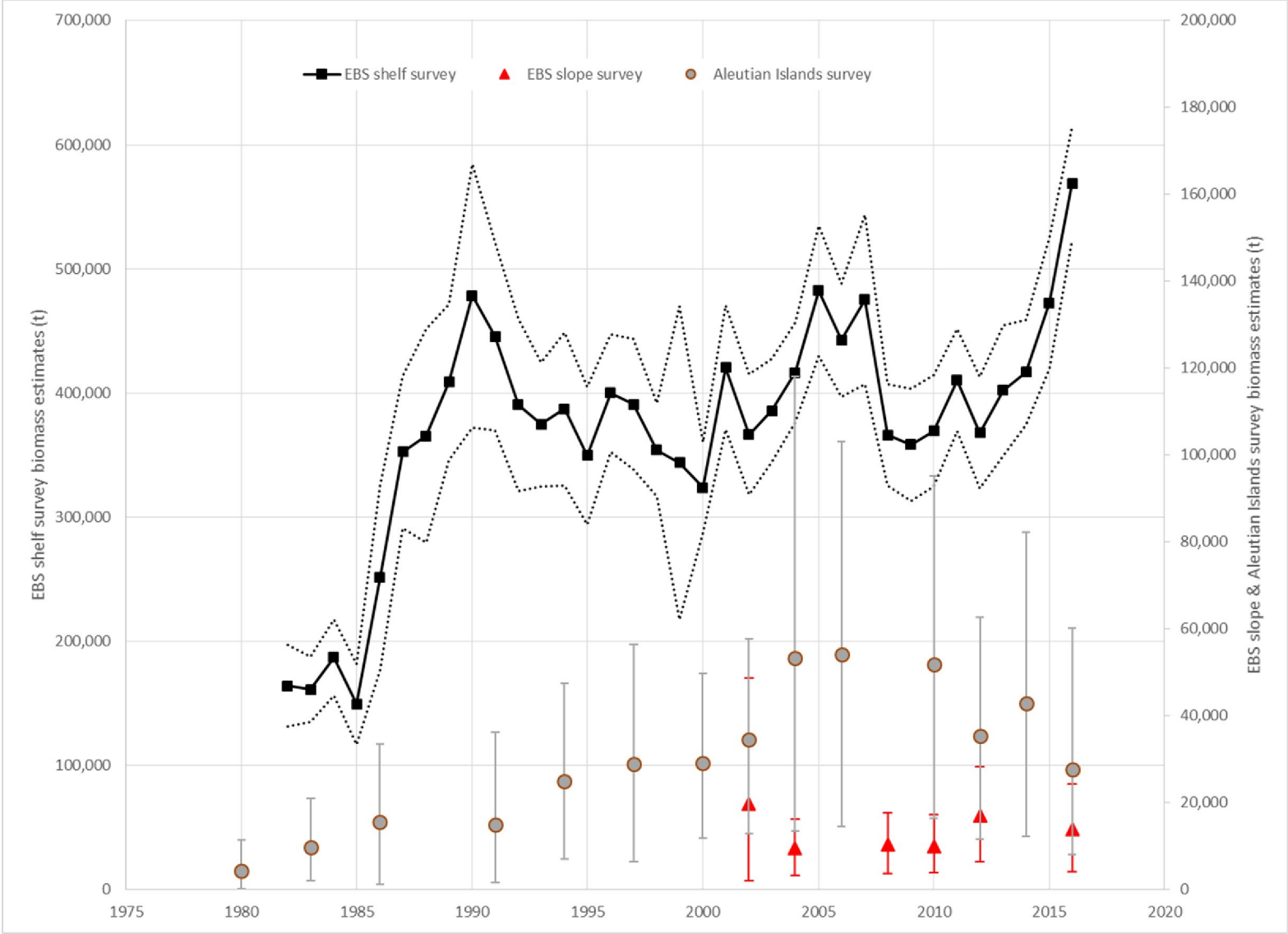NPFMC Groundfish Plan Team meeting, November 2016

overview

- skate complex overview & status

- update on 2014 model comparisons

- Alaska skate assessment

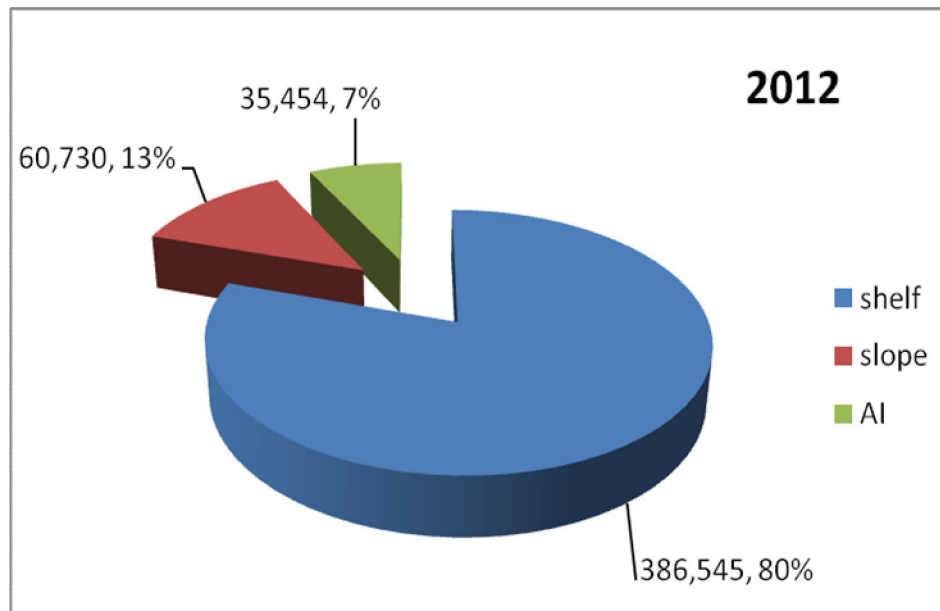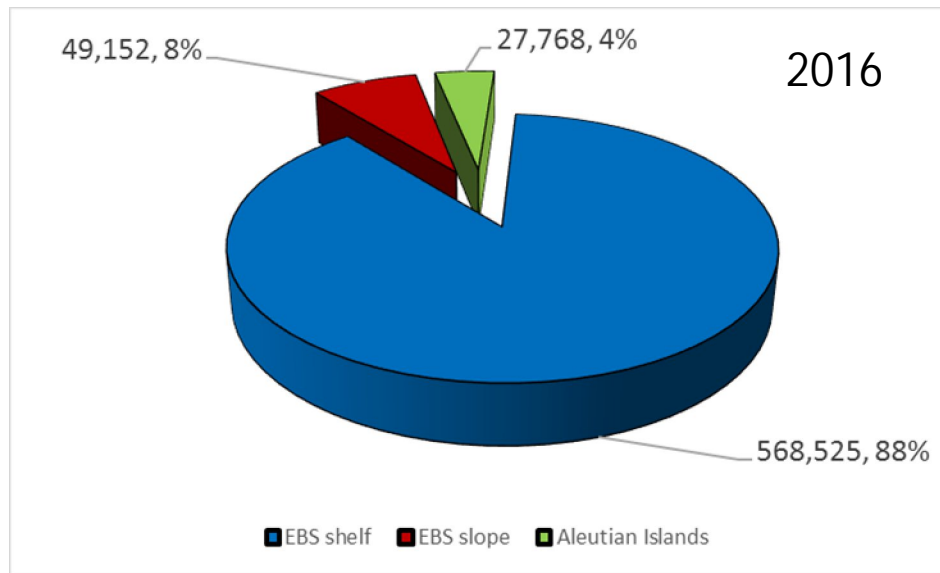- other skate RE results

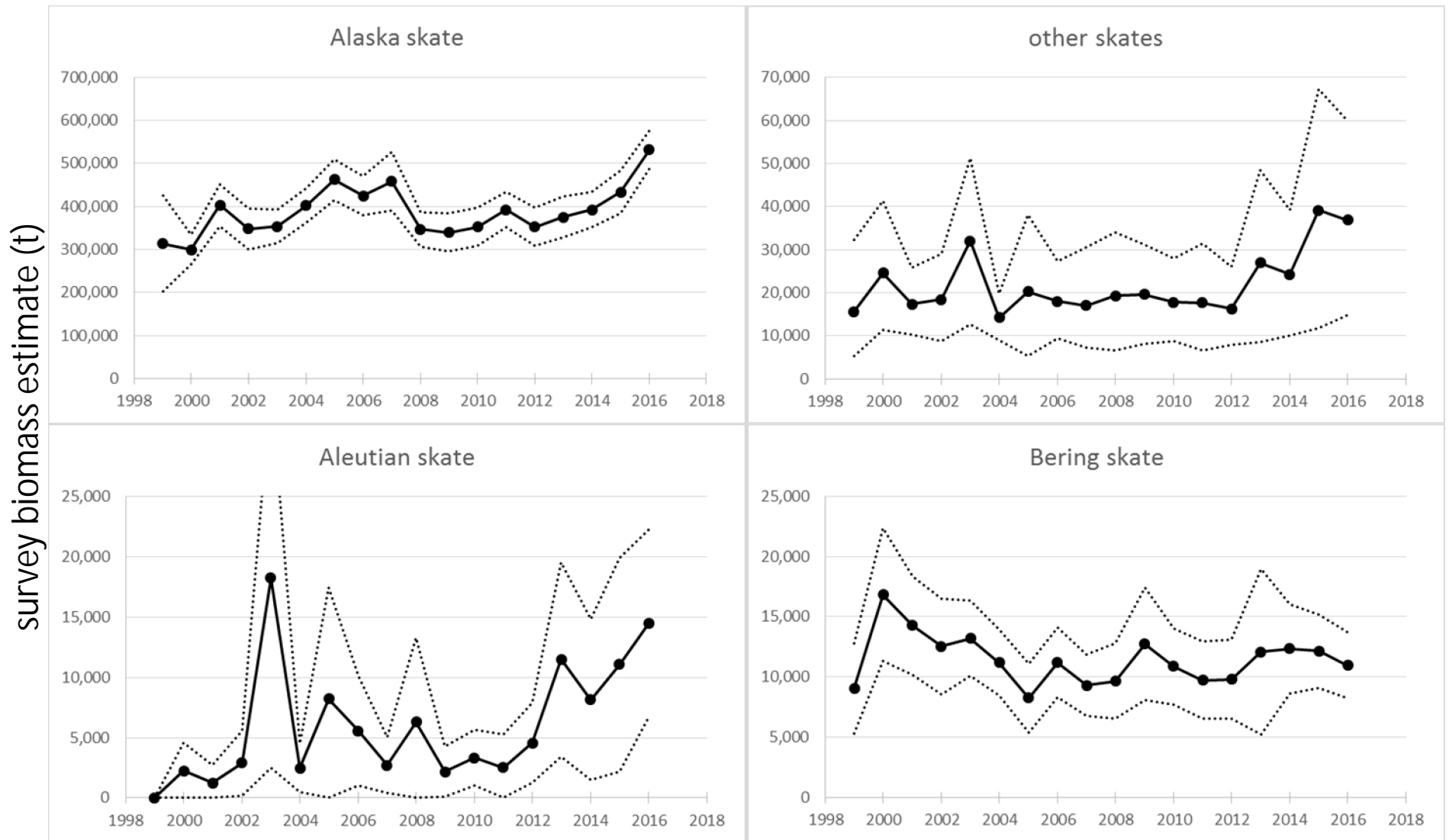- harvest recommendations

BSAI species composition

all skates biomass

changes in distribution by area

2016

49,152, 8%
27,768, 4%
568,525, 88%

EBS shelf   EBS slope   Aleutian Islands

2012

35,454, 7%
60,730, 13%
386,545, 80%

shelf
slope
AI

EBS shelf biomass estimates

EBS slope biomass estimates

survey biomass estimate (t)

AI biomass estimates

BSAI skate catch - by area

BSAI skate catch - by target fishery
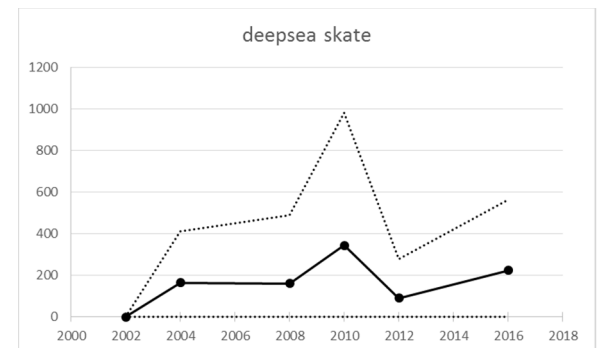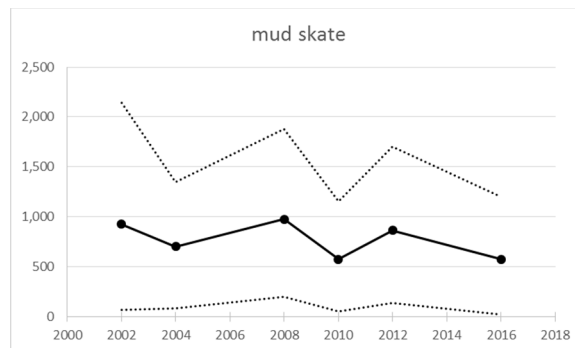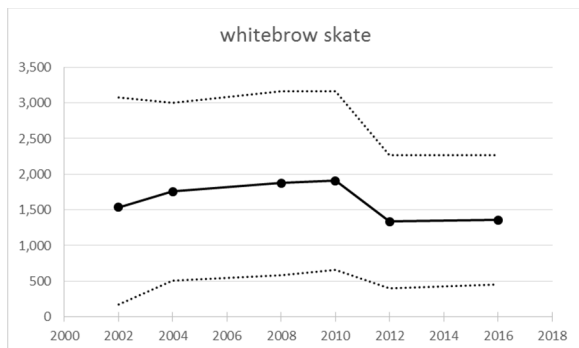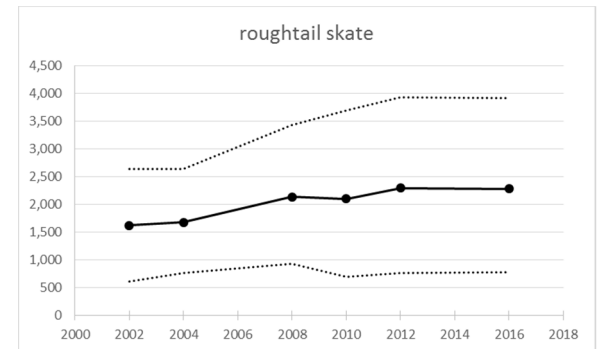
2014 model comparison

$$C_{A,LL} = p_{LL} * F_{OFL} * N_A * S * W_A * sel_{A,LL}$$

$$C_{A,TWL} = p_{TWL} * F_{OFL} * N_A * S * W_A * sel_{A,TWL}$$

AK skate assessment – 2016 model comparison

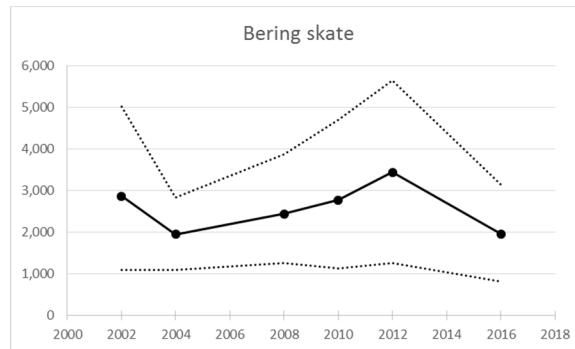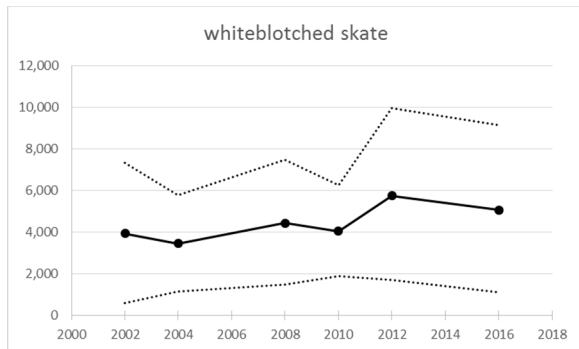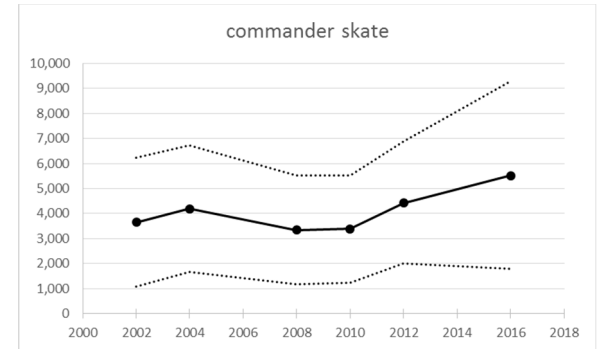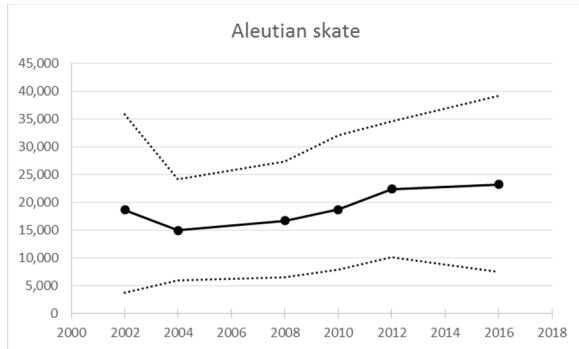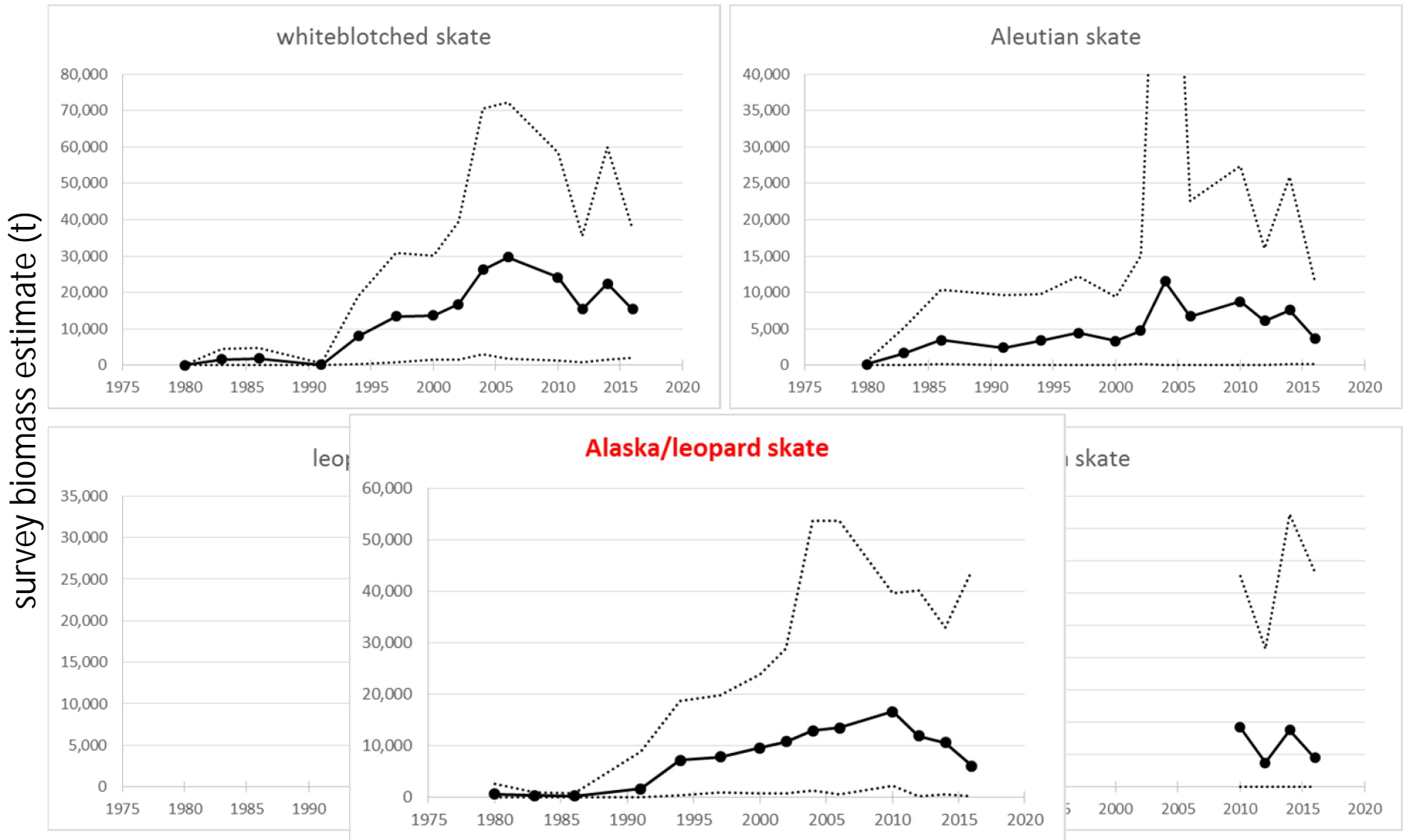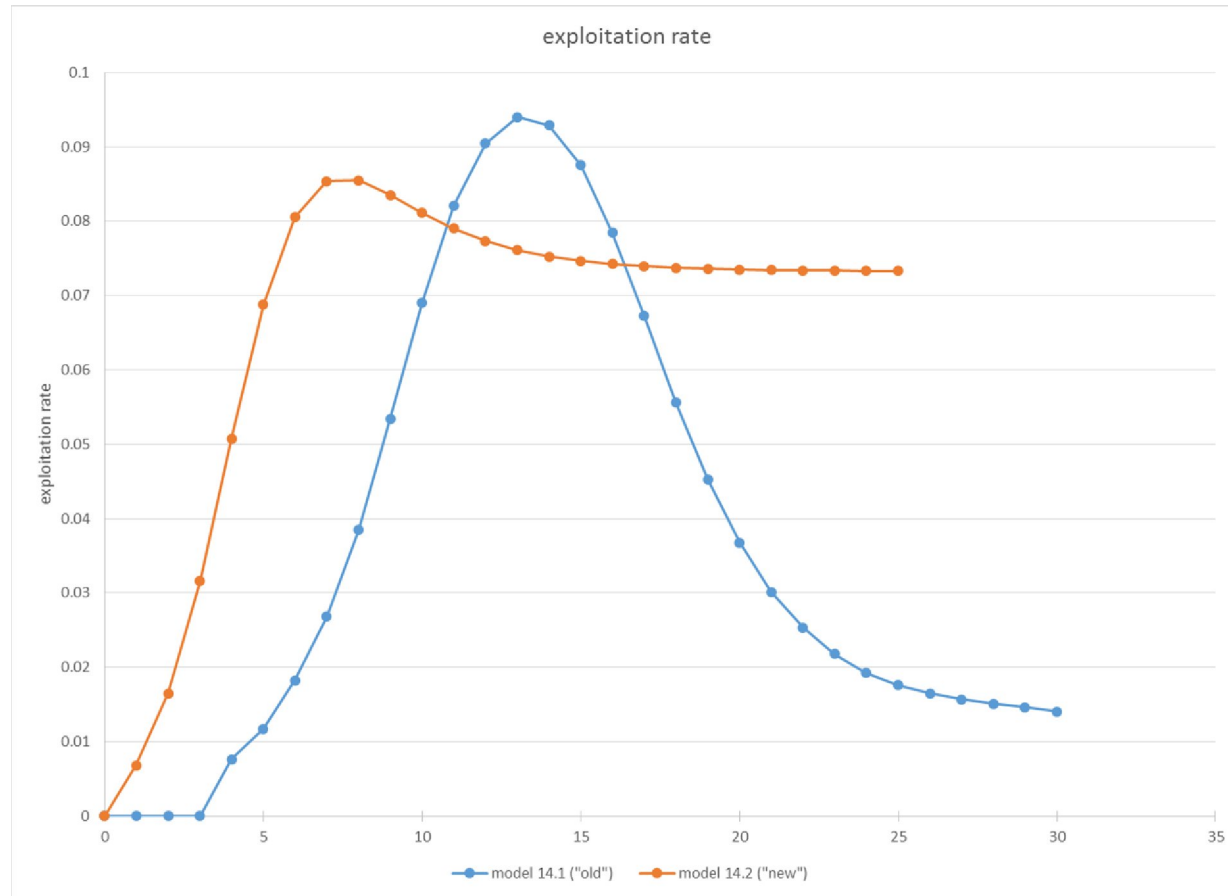| model number	14.2	14.3	14.4
Description	base model (accepted 2014)	base model w/ asymptotic selectivity	base model starting in 1977
likelihood components			
survey	-13.9165	-14.0857	14.6939
length comps	100.518	104.976	100.97
LAA	156.543	158.112	158.106
recruitment	-41.0821	-41.2108	-42.5632
total	202.087	207.815	201.852
# of parameters estimated	91	88	91
L_amin	14.0	14.4	14.1
CV	0.032	0.0293	0.0311
L_amax	102.0	102.2	102.0
CV	0.003	0.0025	0.0026
K	0.38	0.37	0.38
CV	0.019	0.0158	0.0181
CV young	0.35	0.35	0.35
CV	0.0001	0.0004	0.00013
CV old	0.05	0.05	0.05
CV	0.052	0.0003	0.0014
ln (Rzero)	10.12	10.02	10.13
CV	0.004	0.0023	0.0035
unfished spawning biomass_	334,622	301,665	337,425
CV	0.043	0.024	0.038
unfished recruitment	24,738	22,550	25,096
CV	0.040	0.024	0.036
RMSE_survey	0.141	0.142	0.140
% within survey CI	70.6%	64.7%	67.6%
correlation obs-pred	0.764	0.763	0.766
average standardized residual	0.852	0.828	0.824
mean longline input N	77.3	77.3	77.3
mean longline eff N	1000.4	851.1	979.6
mean longline effN/N	12.94	11.01	12.67
mean trawl input N	54.7	54.7	54.7
mean trawl eff N	705.4	571.2	633.8
mean trawl effN/N	12.89	10.44	11.6
mean survey input N	200.0	200.0	200.0
mean survey eff N	887.6	797.4	887.7
mean survey effN/N	4.44	3.99	4.44
mean LAA N	223.8	223.8	223.8
mean LAA eff N	2976.2	2627.0	2970.0
mean LAA eff N/N	13.30	11.74	13.27

AK skate assessment – 2016 model comparison
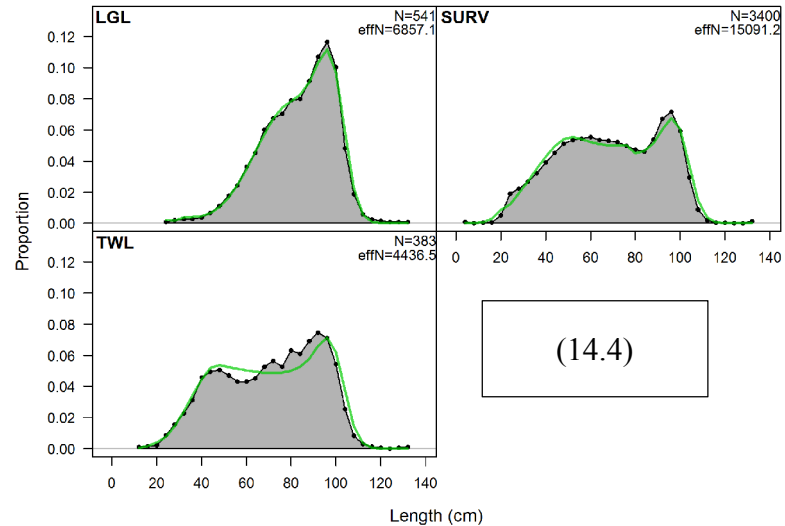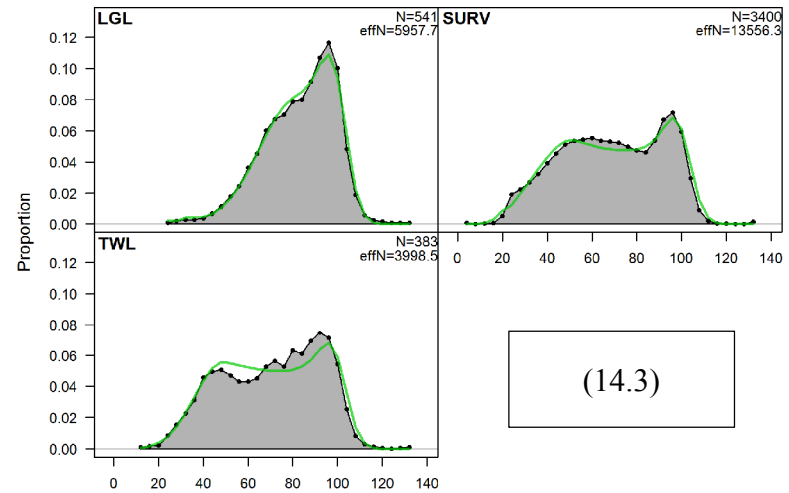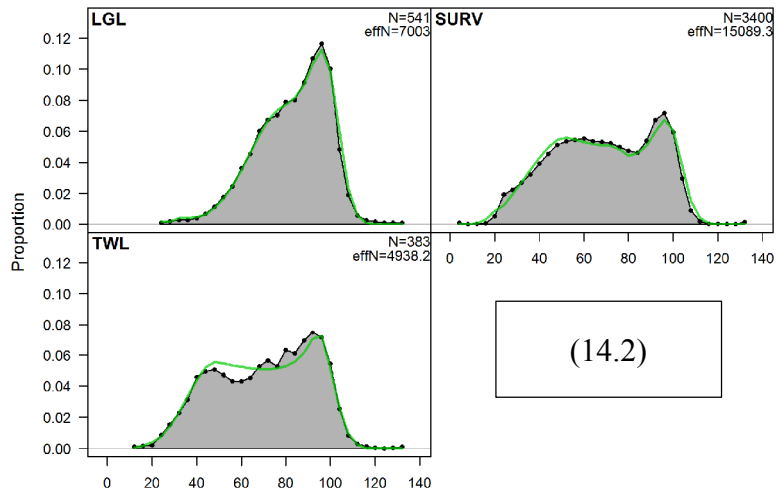
AK skate assessment – 2016 model comparison
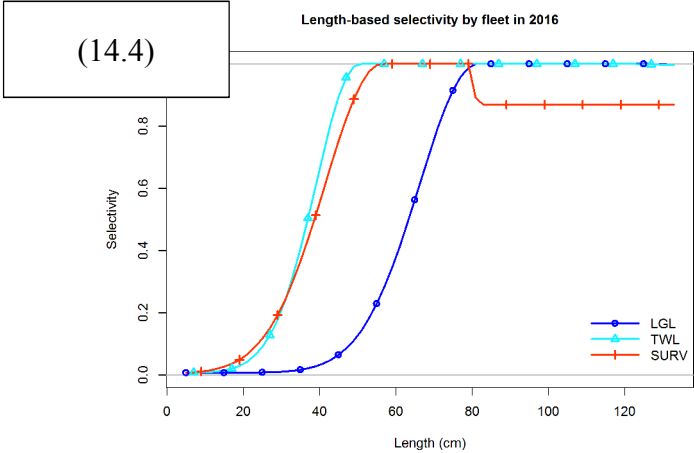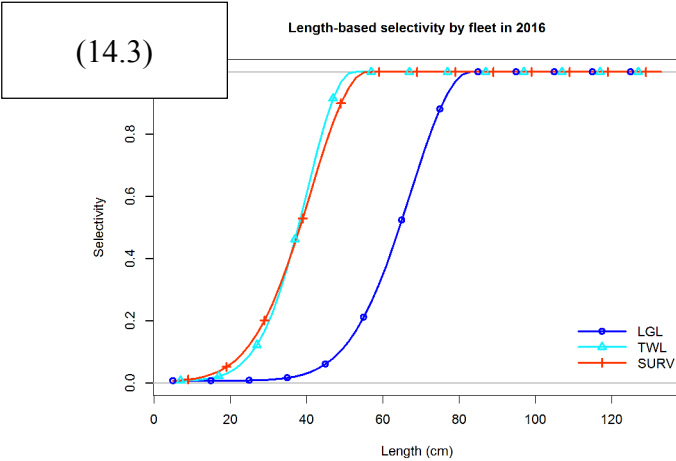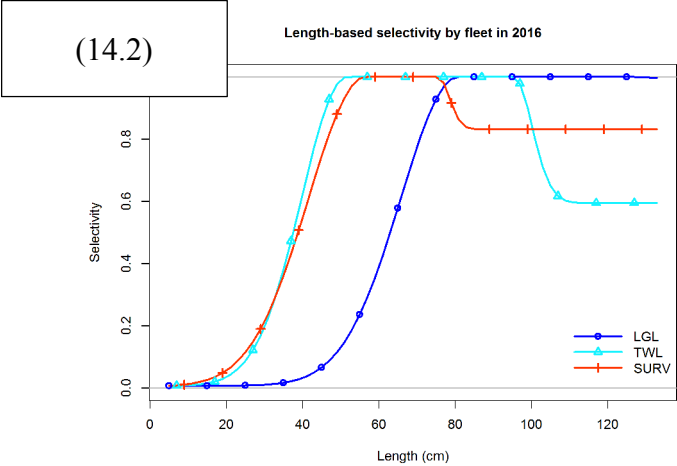
AK skate model 14.2 fits - LAA
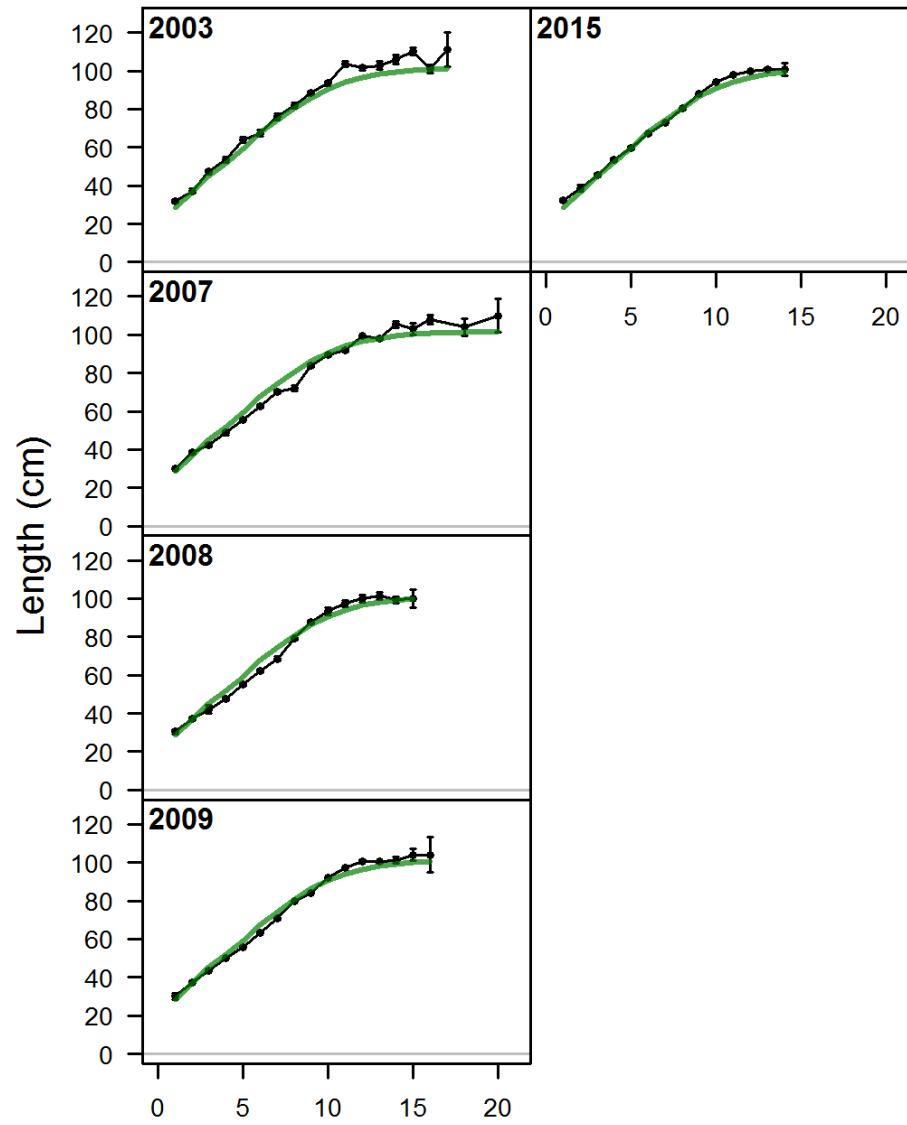
AK skate model 14.2 fits – survey length comp
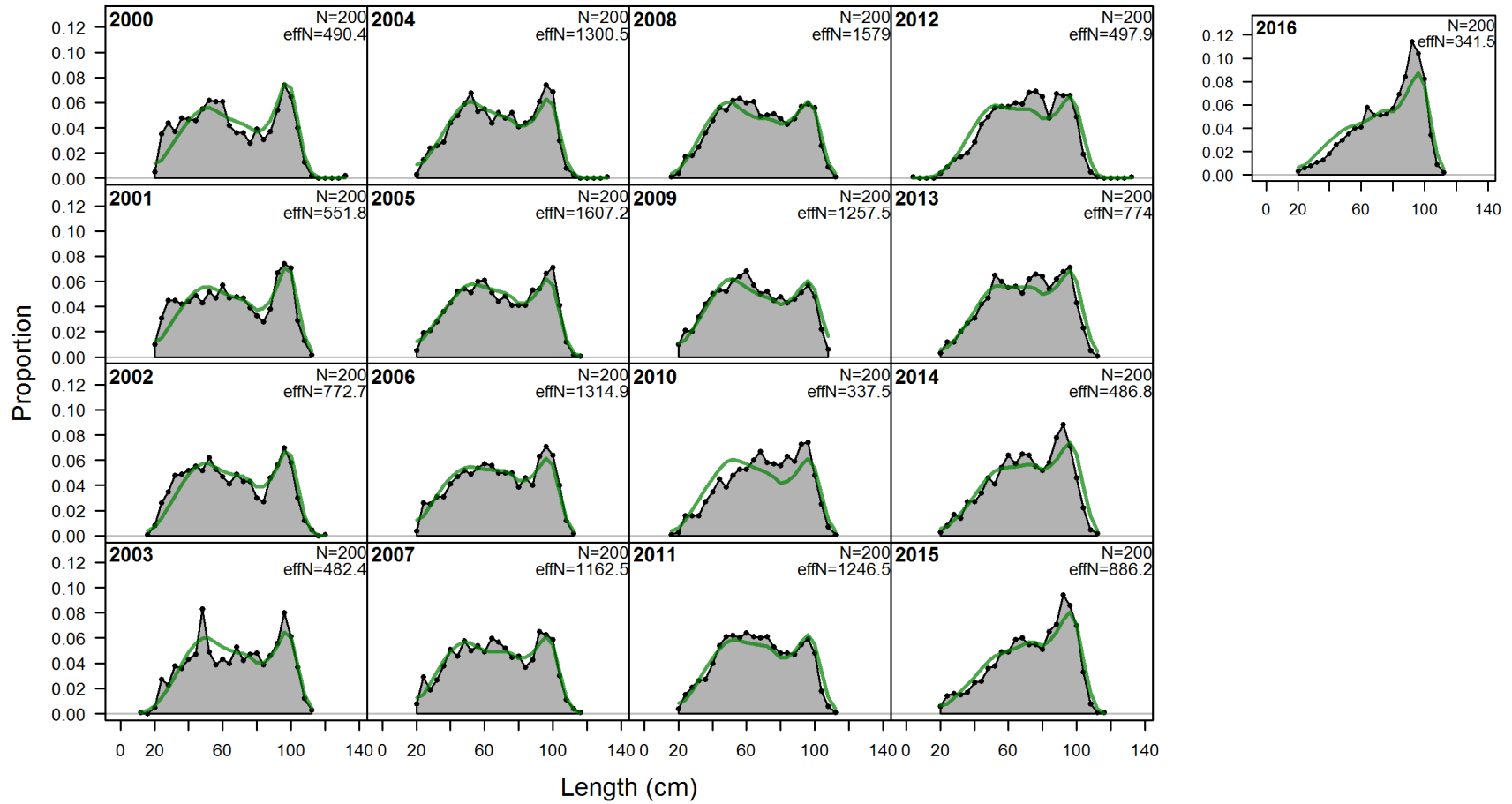
AK skate model 14.2 fits – LL length comp
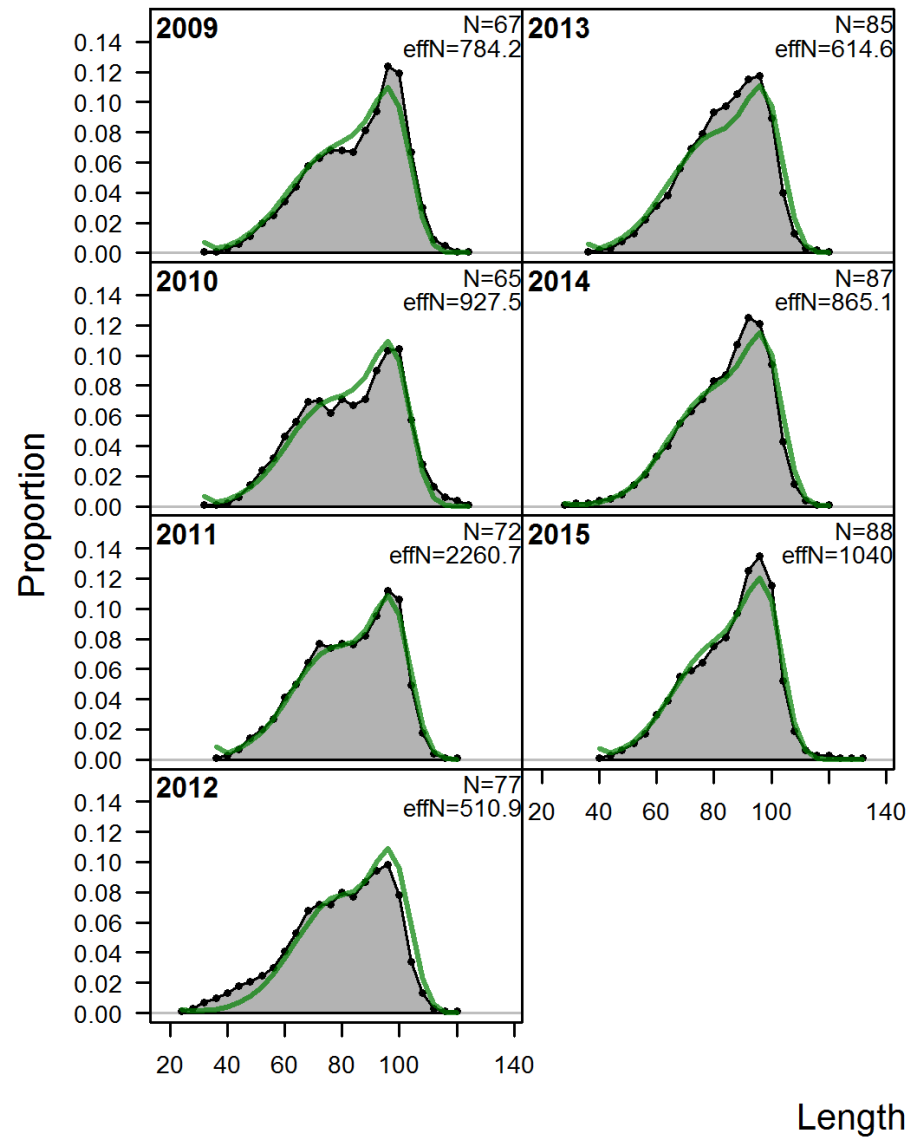
AK skate model 14.2 fits – trawl length comp

AK skate model 14.2 fits – survey

Index SURV
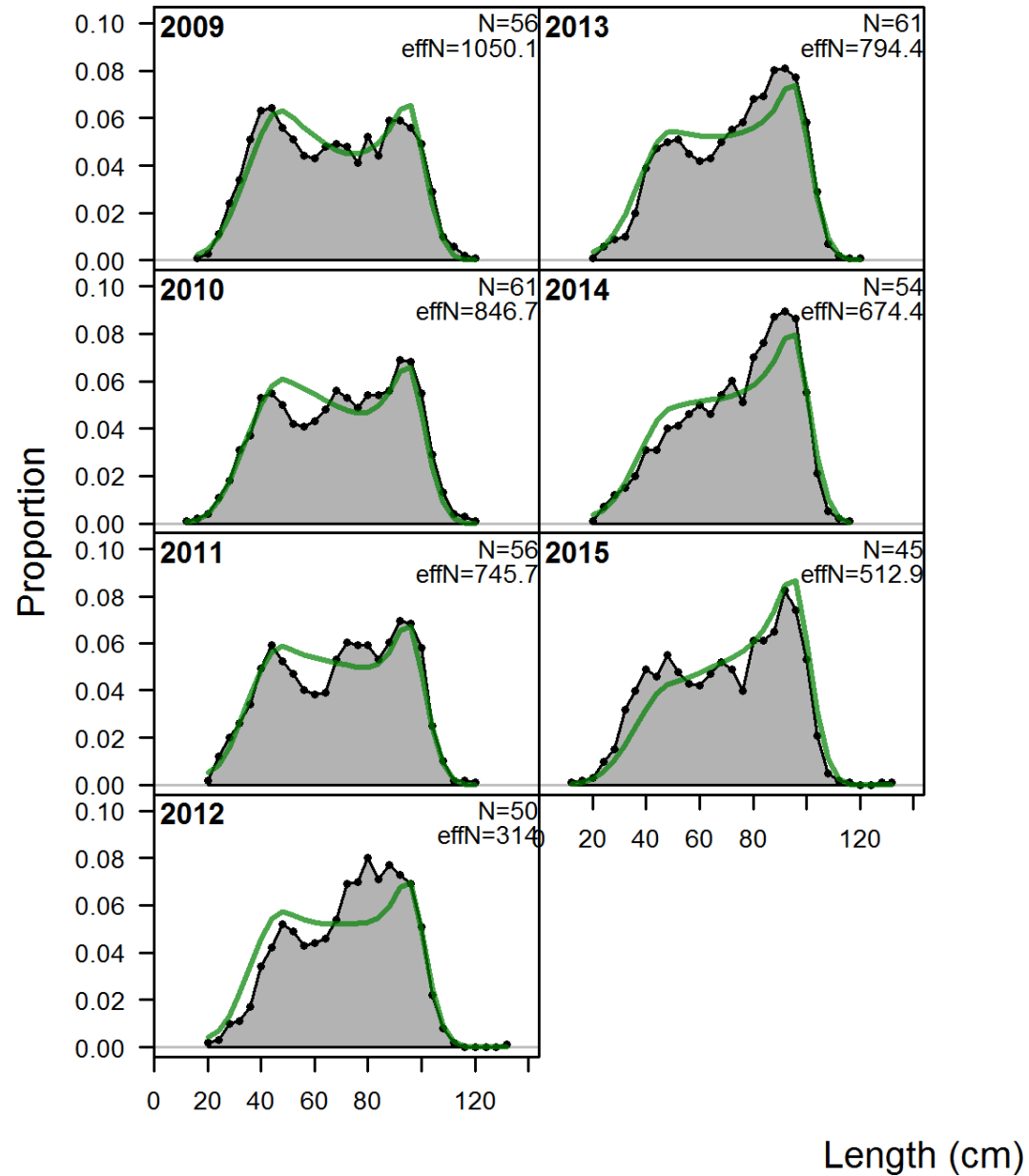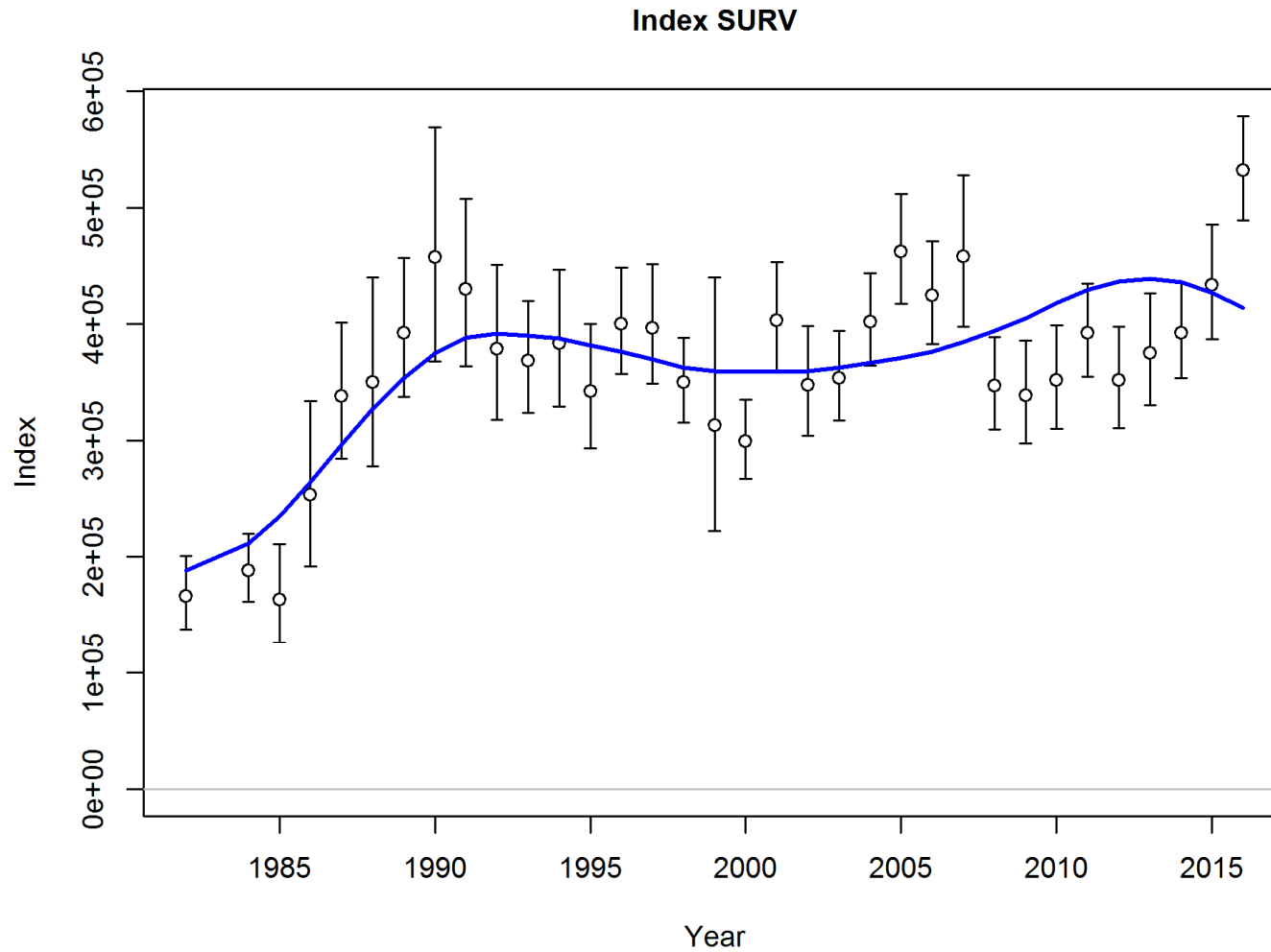
AK skate model 14.2 retrospective
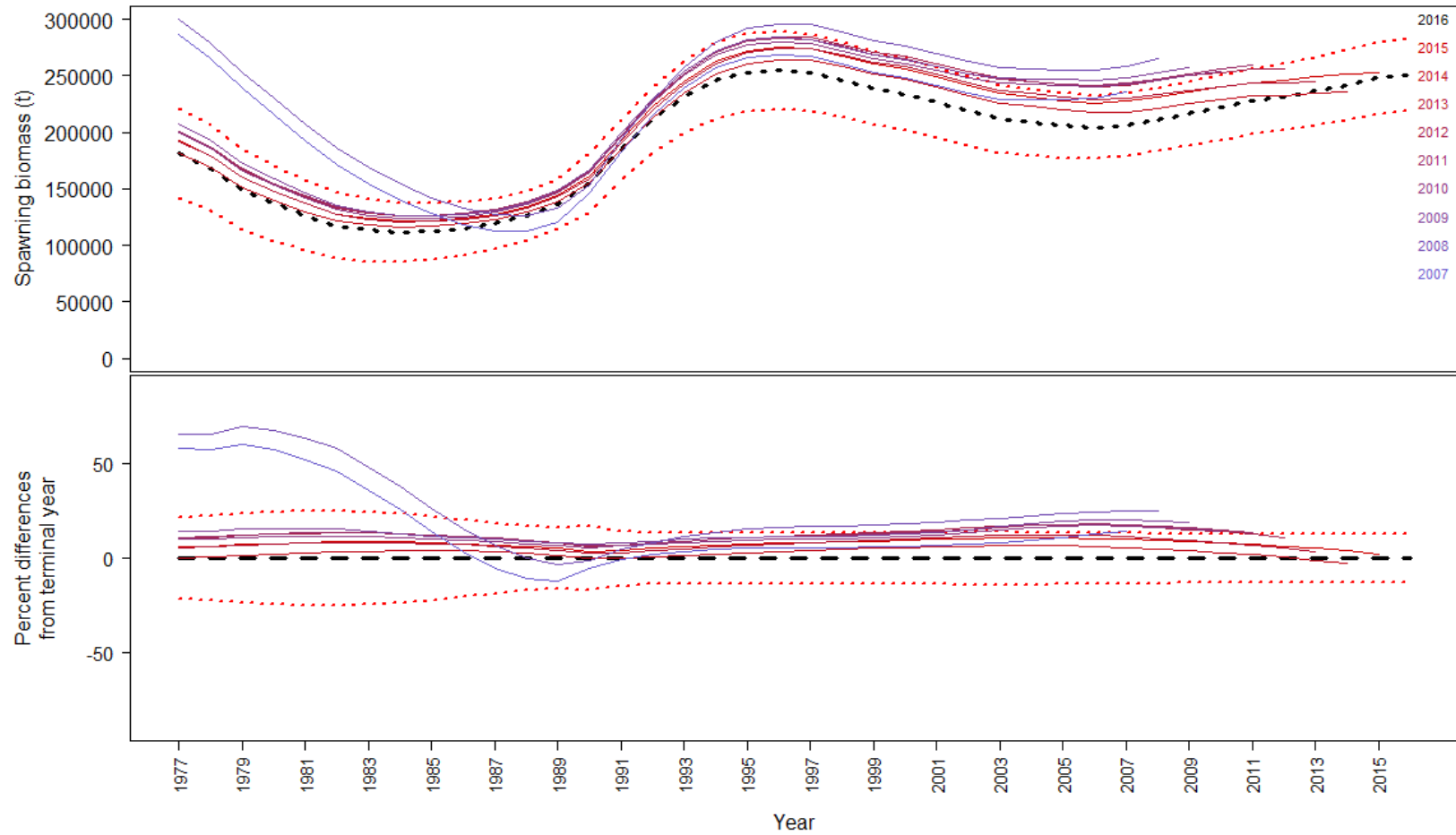
	$\rho_{\text{rev Mohn}}$	$\rho_{\text{Woods Hole}}$	RMSE
spawning biomass	0.111	0.124	0.142
recruitment	0.060	0.044	0.187

AKSK model 14.2 results – spawning bio

Spawning output with ~95% asymptotic intervals
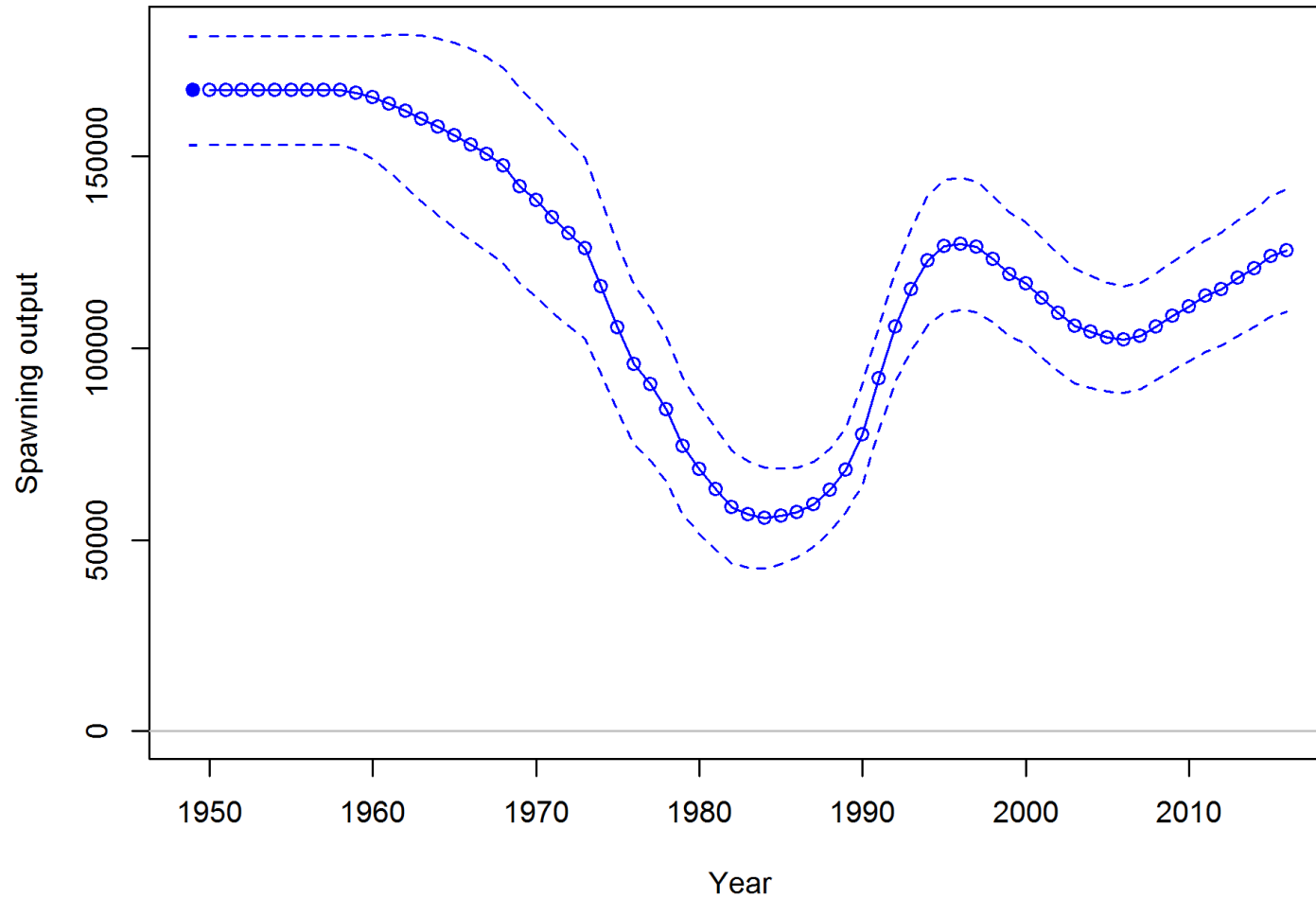
AKSK model 14.2 results - recruits

Age-0 recruits (1,000s) with ~95% asymptotic intervals

AKSK model 14.2 results - # at age

Beginning of year expected numbers at age in (max ~ 56.0 million)

AKSK model 14.2 results – phase plane

AK skate – harvest recs

Alaska skate harvest recommendations

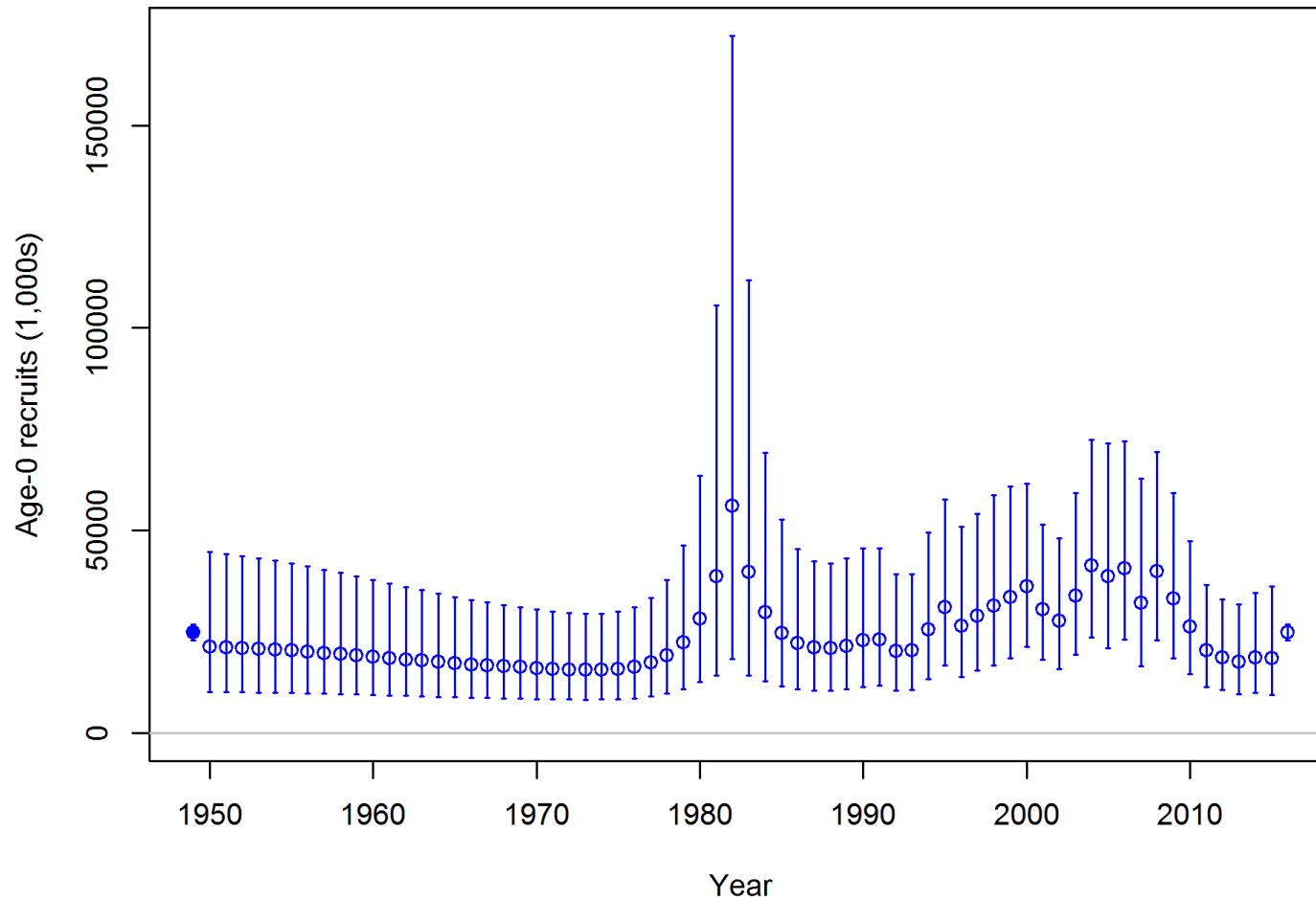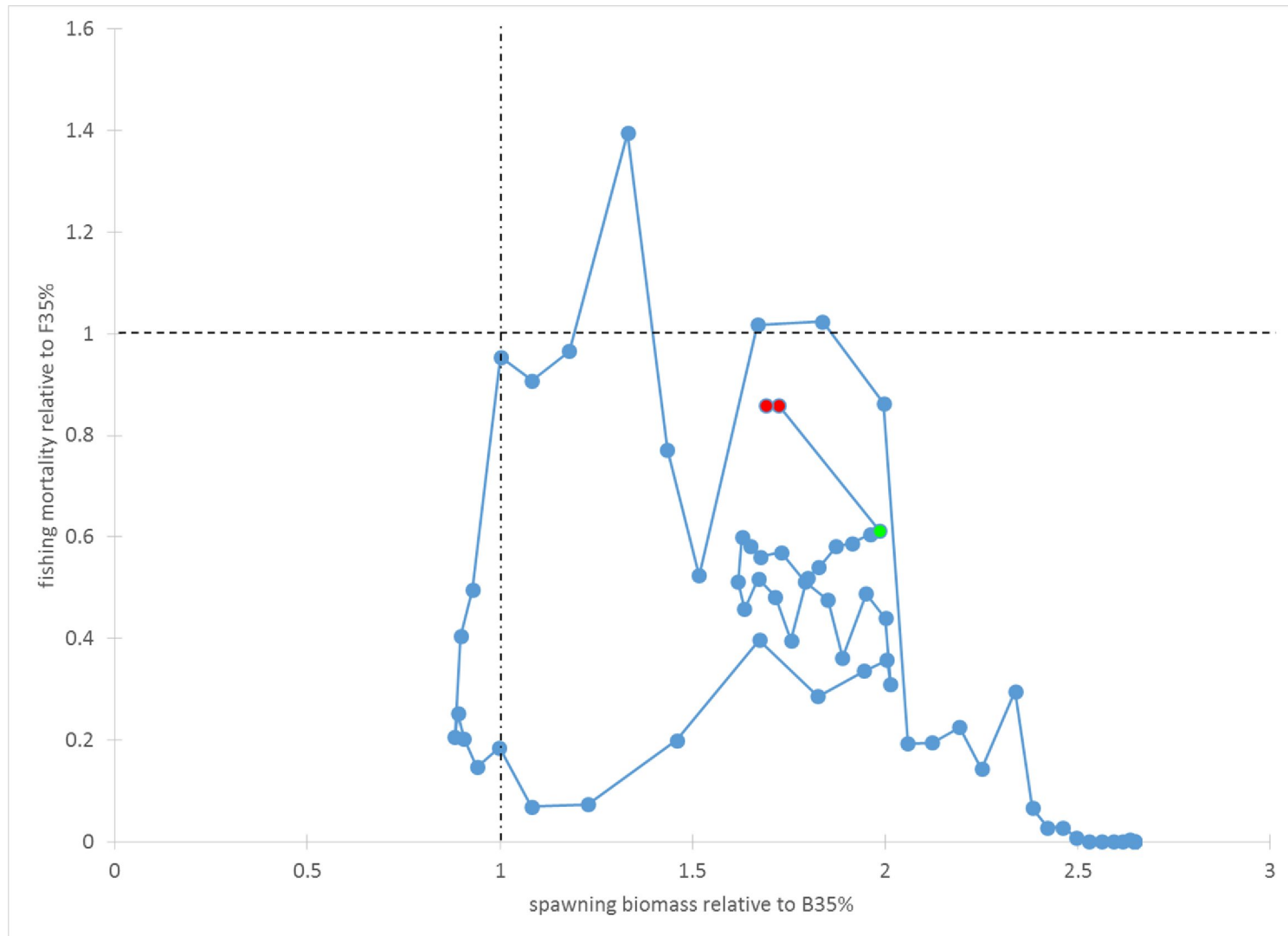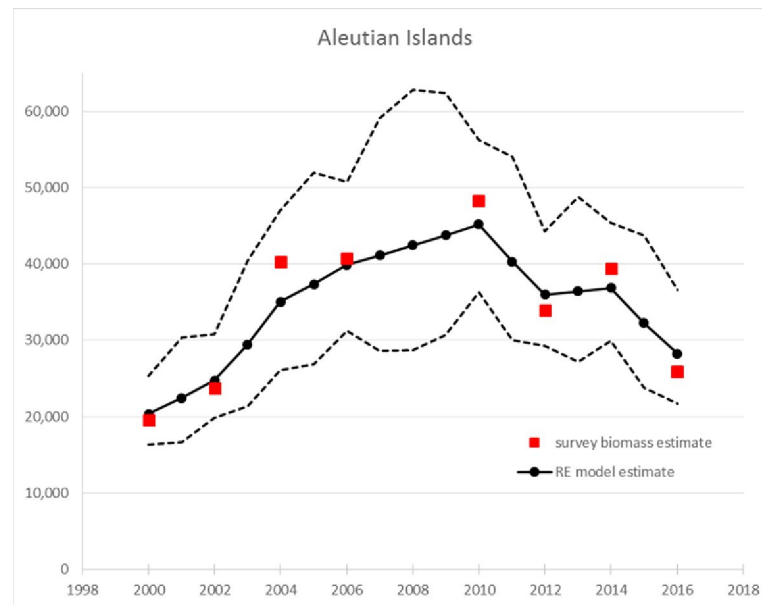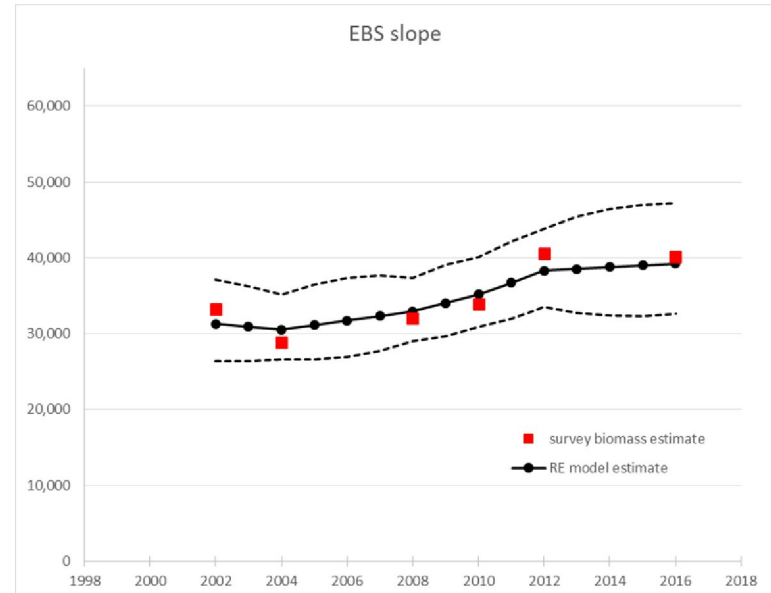| Quantity	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
	2016	2017	2017*	2018*
M (natural mortality rate)	0.13	0.13	**0.13**	0.13
Tier	3a	3a	**3a**	3a
Projected total (age 0+) biomass (t)	527,932	498,546	**505,487**	477,146
Female spawning biomass (t)				
Projected	115,378	112,087	**108,926**	106,871
$B_{100\%}$	186,923	186,923	**180,556**	180,556
$B_{40\%}$	74,769	74,769	**72,222**	72,222
$B_{35\%}$	65,423	65,423	**63,195**	63,195
F_{OFL}	0.090	0.090	**0.092**	0.092
$maxF_{ABC}$	0.077	0.077	**0.079**	0.079
F_{ABC}	0.077	0.077	**0.079**	0.079
OFL (t)	39,847	37,306	**39,050**	36,570
maxABC (t)	34,358	32,167	**33,634**	31,498
ABC (t)	34,358	32,167	**33,634**	31,498
Status	As determined *last* year for:		As determined *this* year for:	
	2014	2015	2015	2016
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

"other skate" RE model results
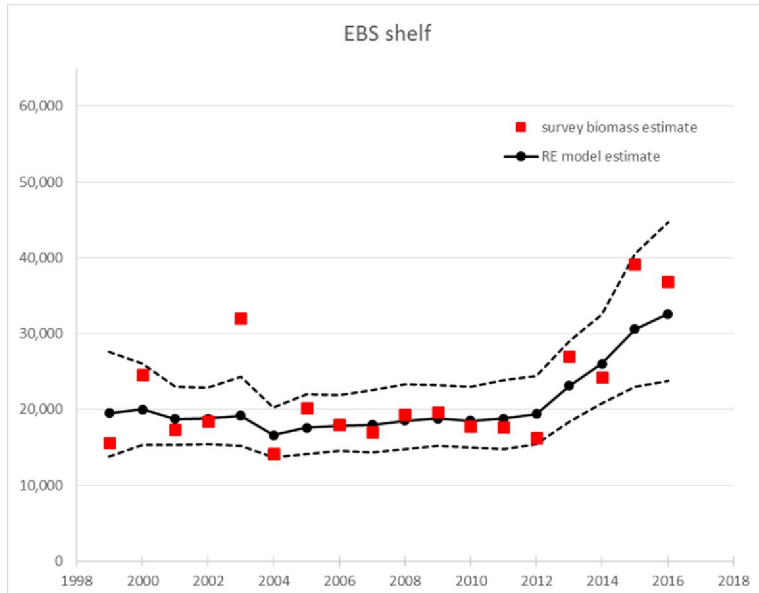
"other skate" harvest recs

	other skate harvest recommendations			
	As estimated or *specified last* year for:		As estimated or *recommended this* year for:	
Quantity	2016	2017	2017	2018
M (natural mortality rate)	*0.1*	*0.1*	**0.1**	0.1
Tier	*5*	*5*	**5**	5
Biomass (t)	*103,682*	*103,682*	**100,130**	100,130
F_{OFL}	*0.1*	*0.1*	**0.10**	0.10
maxF$_{ABC}$	*0.075*	*0.075*	**0.075**	0.075
F_{ABC}	*0.075*	*0.075*	**0.075**	0.075
OFL (t)	*10,368*	*10,368*	**10,013**	10,013
maxABC (t)	*7,776*	*7,776*	**7,510**	7,510
ABC (t)	*7,776*	*7,776*	**7,510**	7,510
	As determined *last* year for:		As determined *this* year for:	
Status	2014	2015	2015	2016
Overfishing	No	n/a	No	n/a

title

title

title

title

title

title

title

title

title

title

title

title

title

title

title

title

title

title