



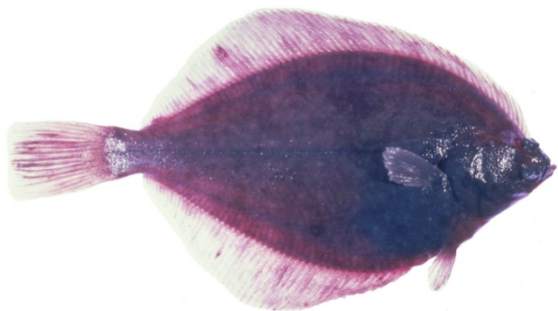
# BSAI Alaska plaice

by

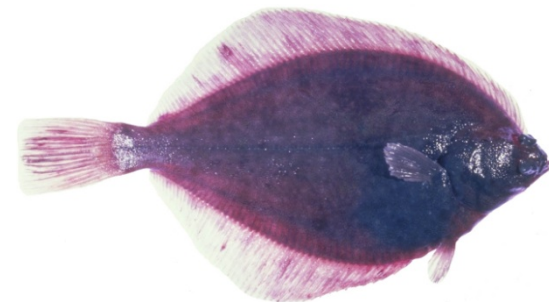
Wilderbuer and Nichol

# Changes to the input data

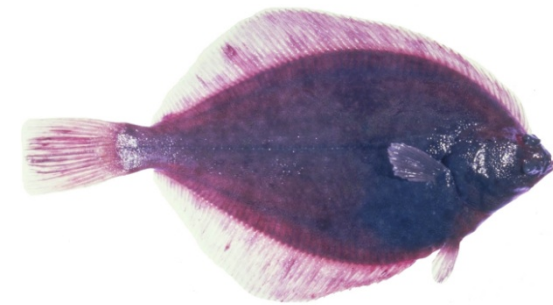
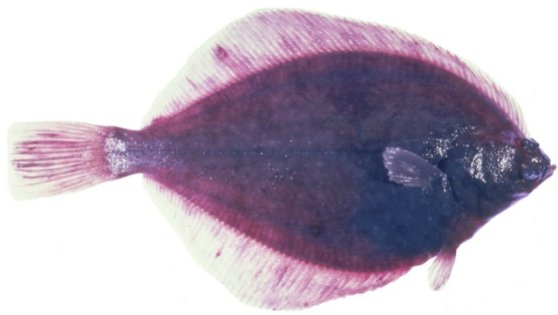
- **2019 shelf survey size composition**
- **2018 and 2019 shelf survey biomass point estimates and standard errors**
- **Estimate of catch (t) and discards for 2018 and 2019**
- **Estimate of retained and discarded portions of the 2018 catch**
- **2018 shelf survey age composition**
- **Fishery size compositions 2017-2019**
- **Methodology unchanged**



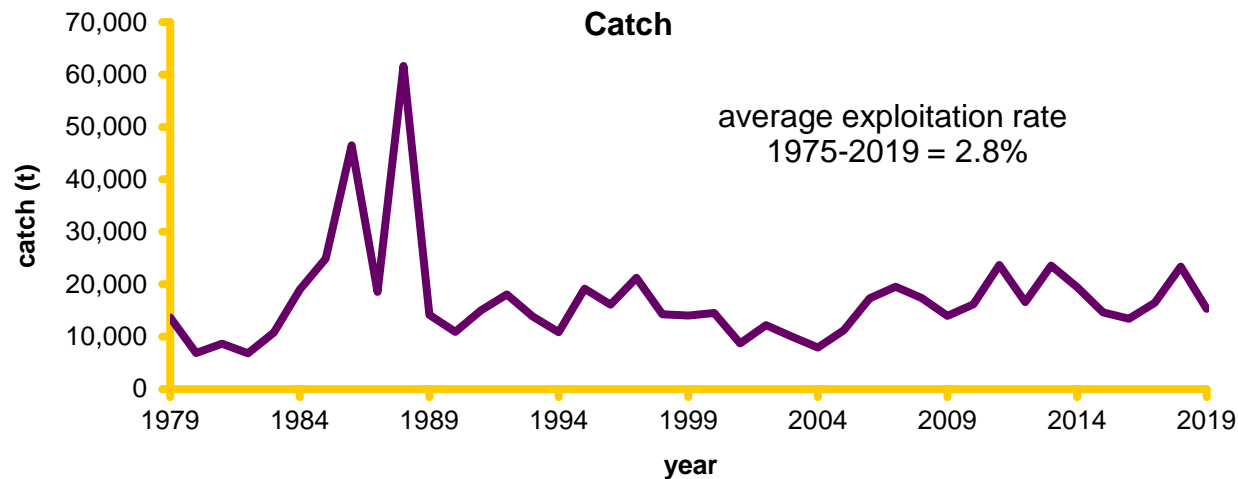
## Alaska plaice

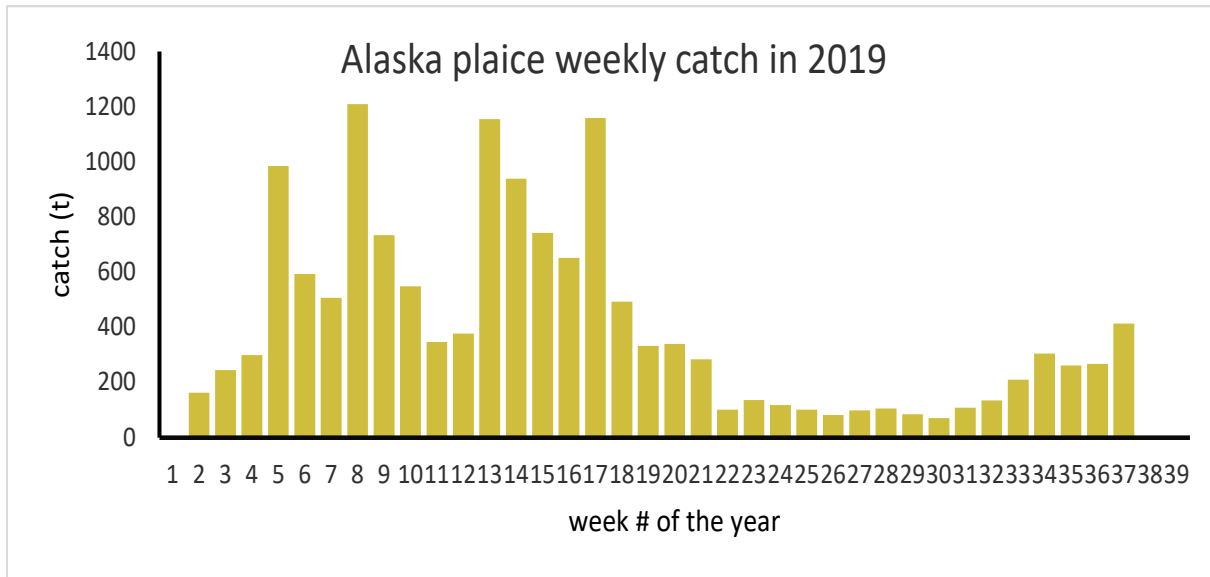
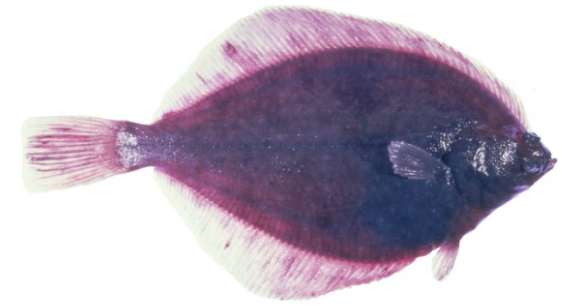


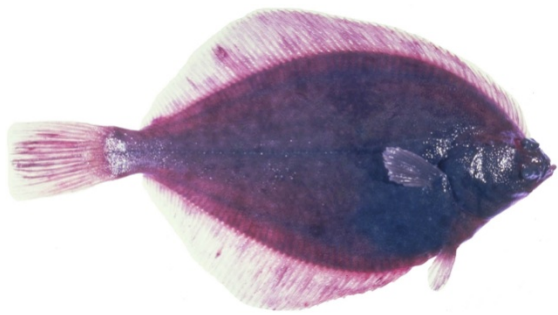
Quantity	As estimated or specified last year for:		As estimated or recommended this year for:	
	2019	2020	2020	2021
M (natural mortality rate)	0.13	0.13	0.13	0.13
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	400,700	394,700	428,800	435,700
Female spawning biomass (t)	186,100	171,100	170,800	161,000
$B_{100\%}$	317,360	317,360	333,300	333,300
$B_{40\%}$	126,900	126,900	133,300	133,300
$B_{35\%}$	111,100	111,100	116,600	116,600
$F_{OFL}$	0.149	0.149	0.15	0.15
$\max F_{ABC}$	0.124	0.124	0.125	0.125
$F_{ABC}$	0.124	0.124	0.125	0.125
OFL (t)	39,880	37,860	37,600	36,500
$\max ABC$ (t)	33,600	31,900	31,600	30,700
ABC (t)				
Status	As determined last year for:		As determined this year for:	
	2017	2018	2018	2019
Overfishing	no	n/a	No	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no



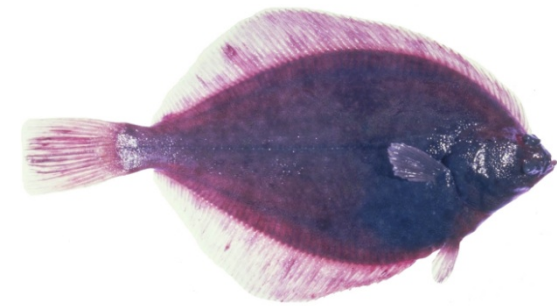
2019 catch = 15,812 t (11/2/2019)  
average 1975-2019 exploitation rate = 2.8%



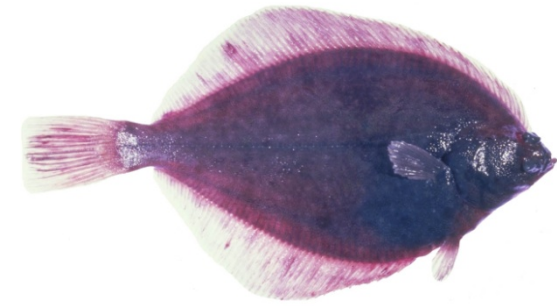
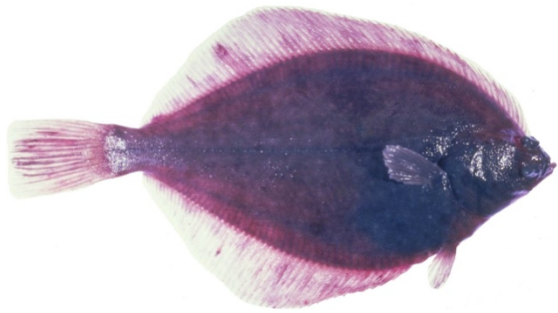




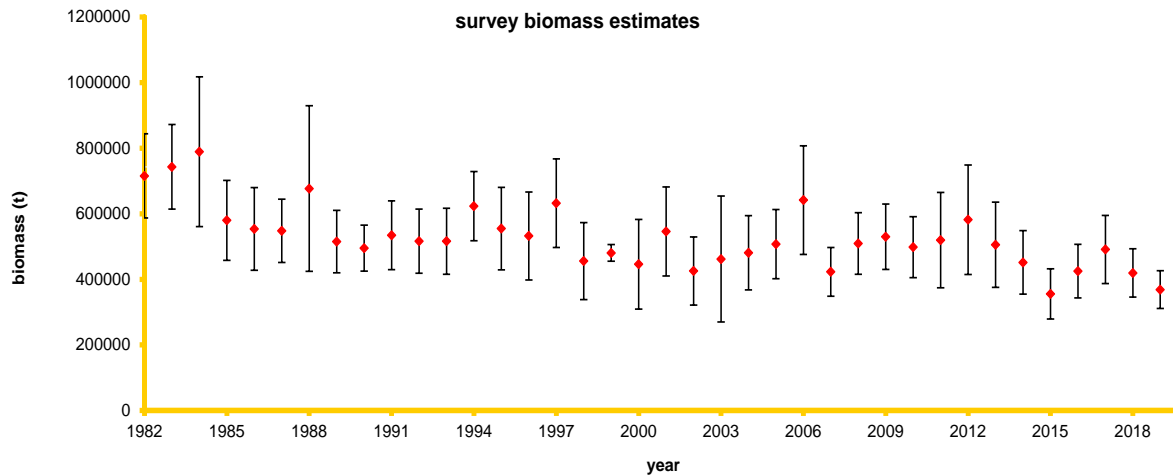
# Alaska plaice



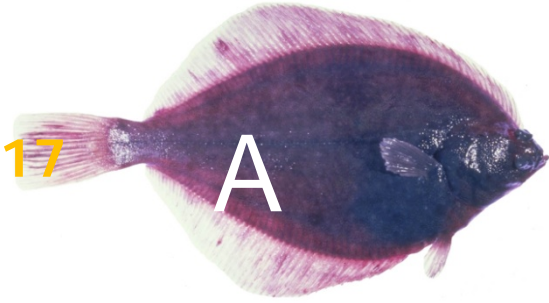
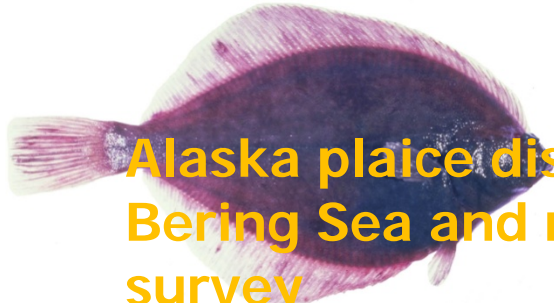
year	Discard	Retained	Total	Proportion discarded
2002	11,806	370	12,176	0.97
2003	9,428	350	9,778	0.96
2004	7,193	379	7,572	0.95
2005	10,293	786	11,079	0.93
2006	14,746	2,564	17,310	0.85
2007	15,481	3,946	19,427	0.8
2008	9,330	8,046	17,376	0.54
2009	5,061	8,882	13,945	0.36
2010	5,845	10,322	16,166	0.36
2011	7,197	16,459	23,656	0.30
2012	3,589	13,023	16,611	0.22
2013	9,053	14,470	23,523	0.38
2014	3,702	15,747	19,449	0.19
2015	1,231	13,382	14,614	0.08
2016	2,070	11,315	13,385	0.15
2017	1,954	14,538	16,492	0.14
2018	2,019	21,323	23,342	0.13



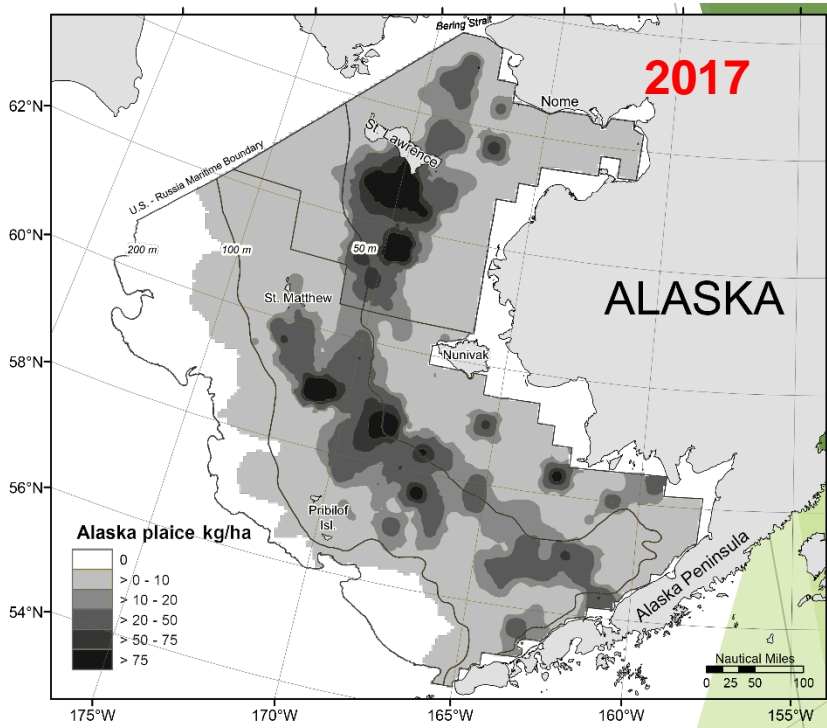
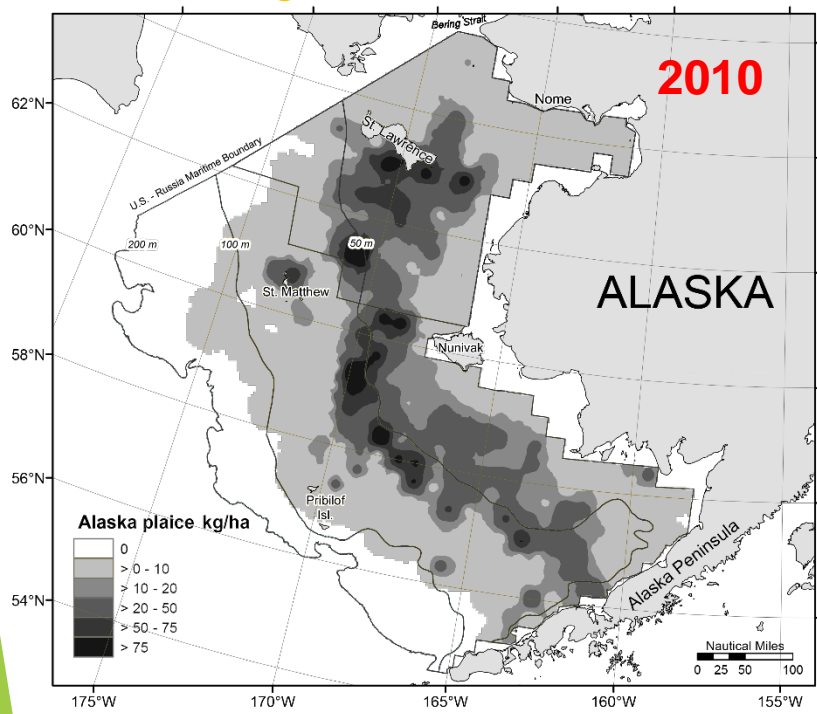
2019 shelf survey biomass estimate = 368,800 t  
12% decrease from 2018 to 2019





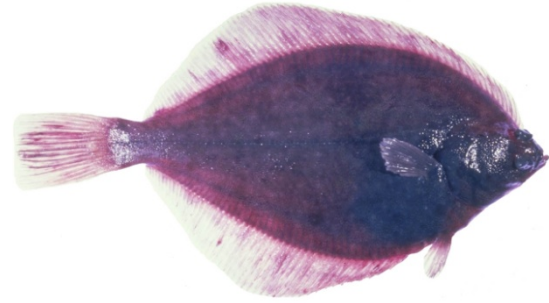


# Alaska plaice distribution in the 2010 and 2017 Bering Sea and northern Bering Sea trawl survey



- ▶ 38% of the 2010 total biomass was found in the northern Bering Sea.
- ▶ 40% of the 2017 total biomass was found in the northern Bering Sea





# Alaska plaice split-sex model

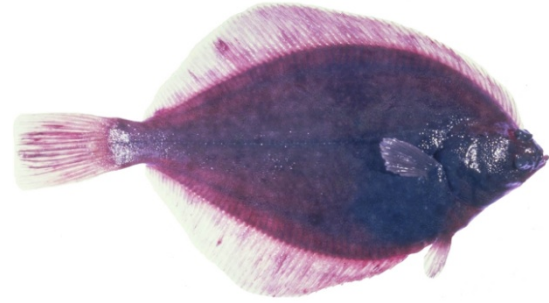
uses:

sex-specific estimates of fishery and survey age composition and length composition and weight at age

Estimates:

Sex-specific estimates of population number, fishing mortality, selectivity, fishery and survey age composition.

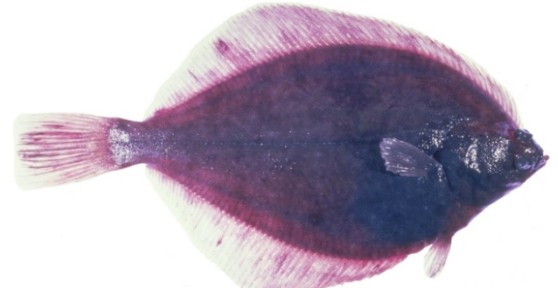
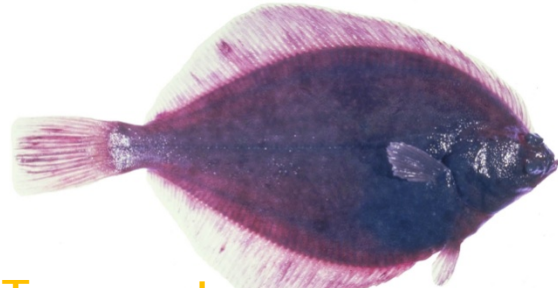
Allows for estimation of sex-specific natural mortality



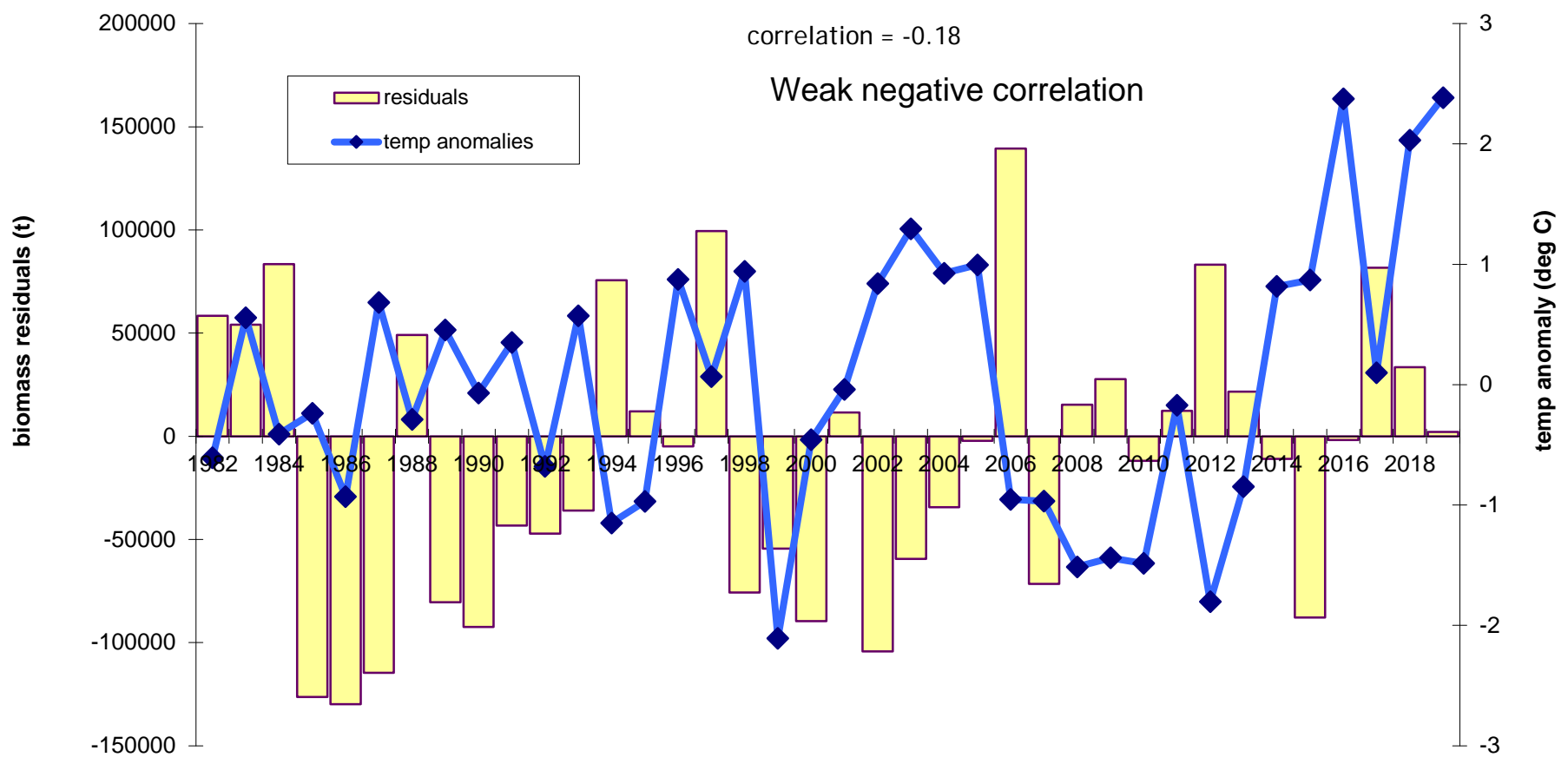
# Stock assessment model

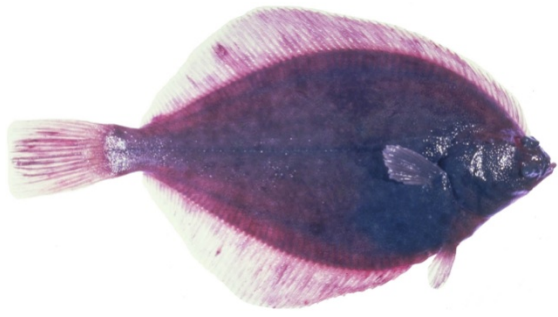
Data components include:

- fishery size comps 1983-87, 1989-91, 1996-1997, 1999, 2003-2005, 2008-2018
- fishery age comps 2000, 2002-2003
- Survey biomass 1982-2019
- Survey age comps 1982, 1988, 1992-1995, 1998, 2000-2002, 2005-2014, 2016-2018
- Survey length comps 1983-1987, 1989-91, 1996-97, 1999, 2003-2004, 2015, 2019
- selectivity is fixed asymptotic for older fish.
- natural mortality was fixed at 0.13 for males and females
- Catchability was fixed at 1.2 and was found not to be related to temperature in a past assessment (Spencer et al. 2004)

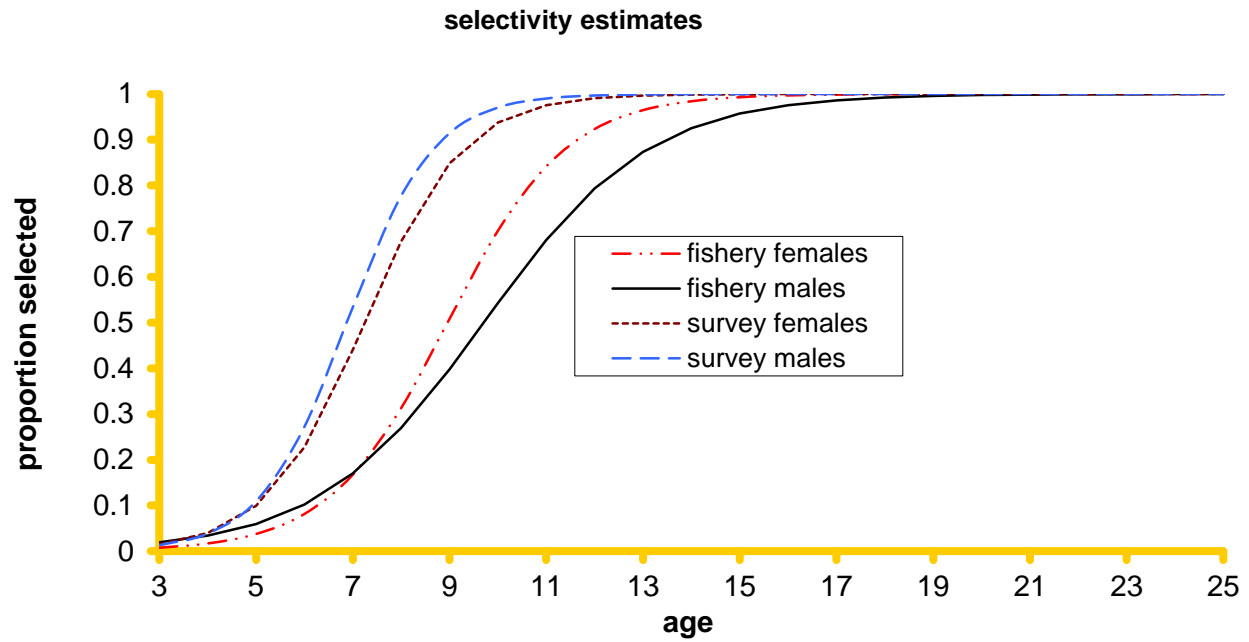
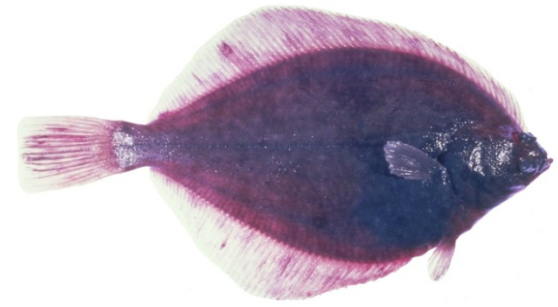


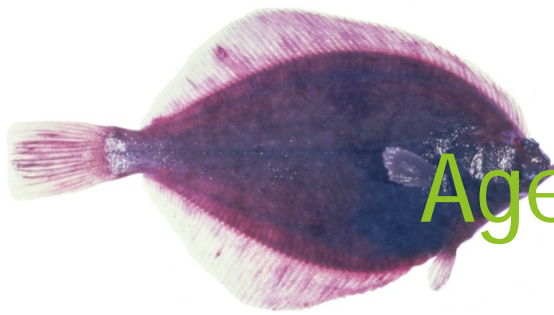
# Temperature seems unrelated to catchability



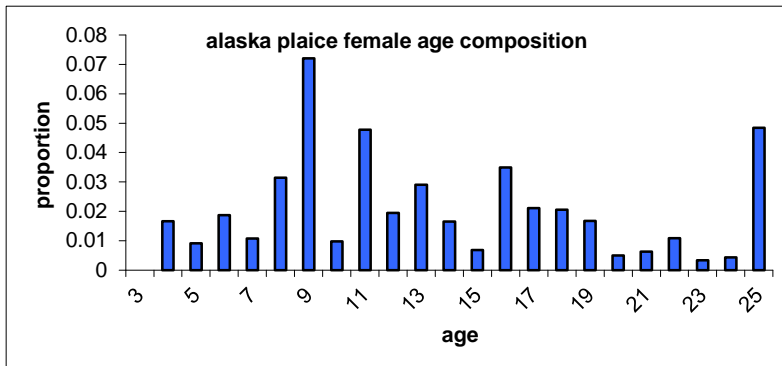


# Alaska plaice

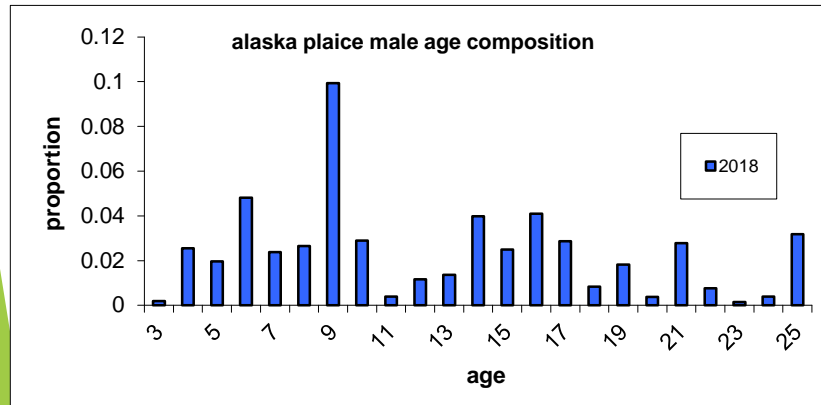




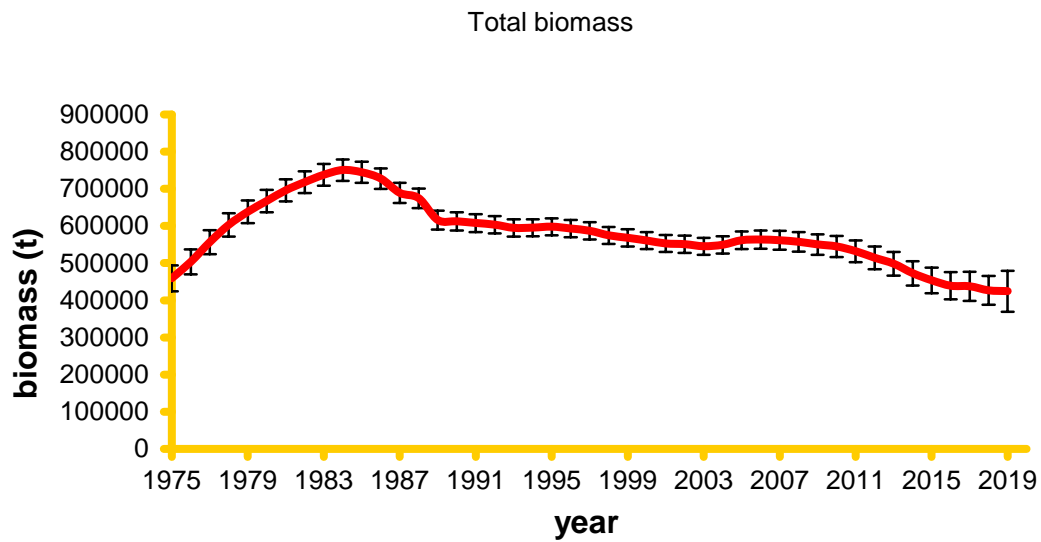
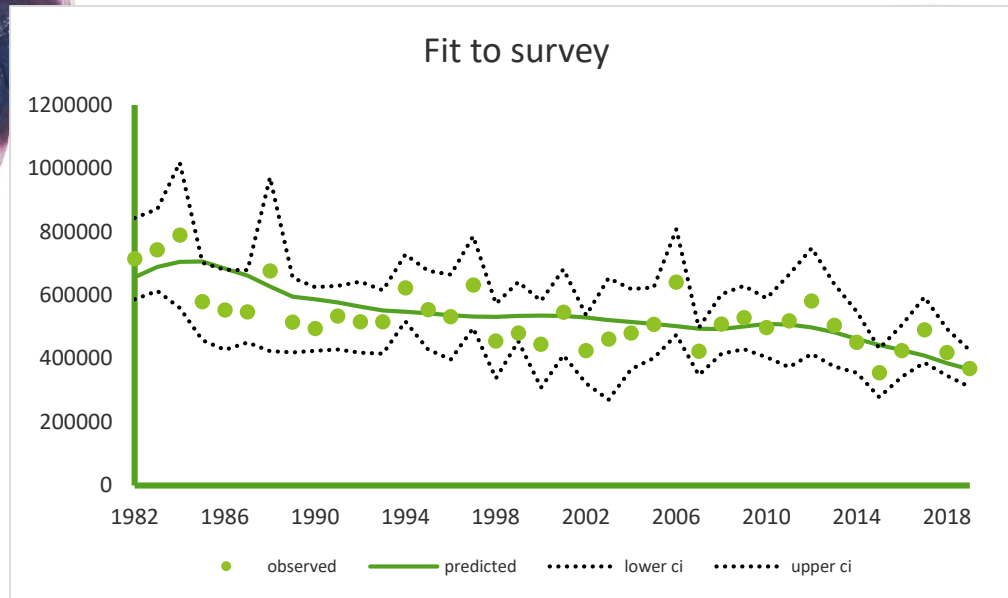
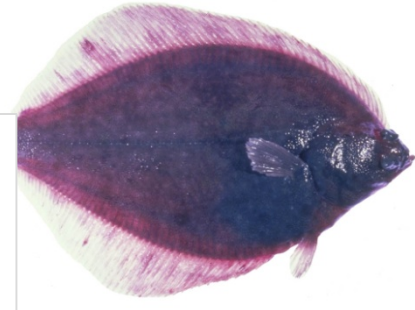
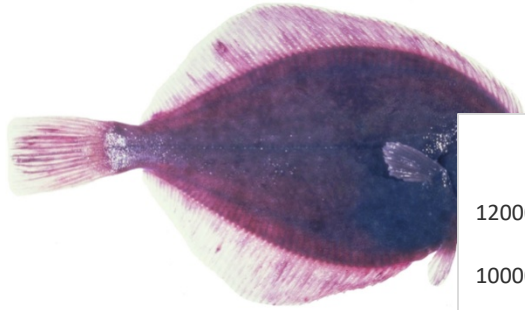
# Age composition



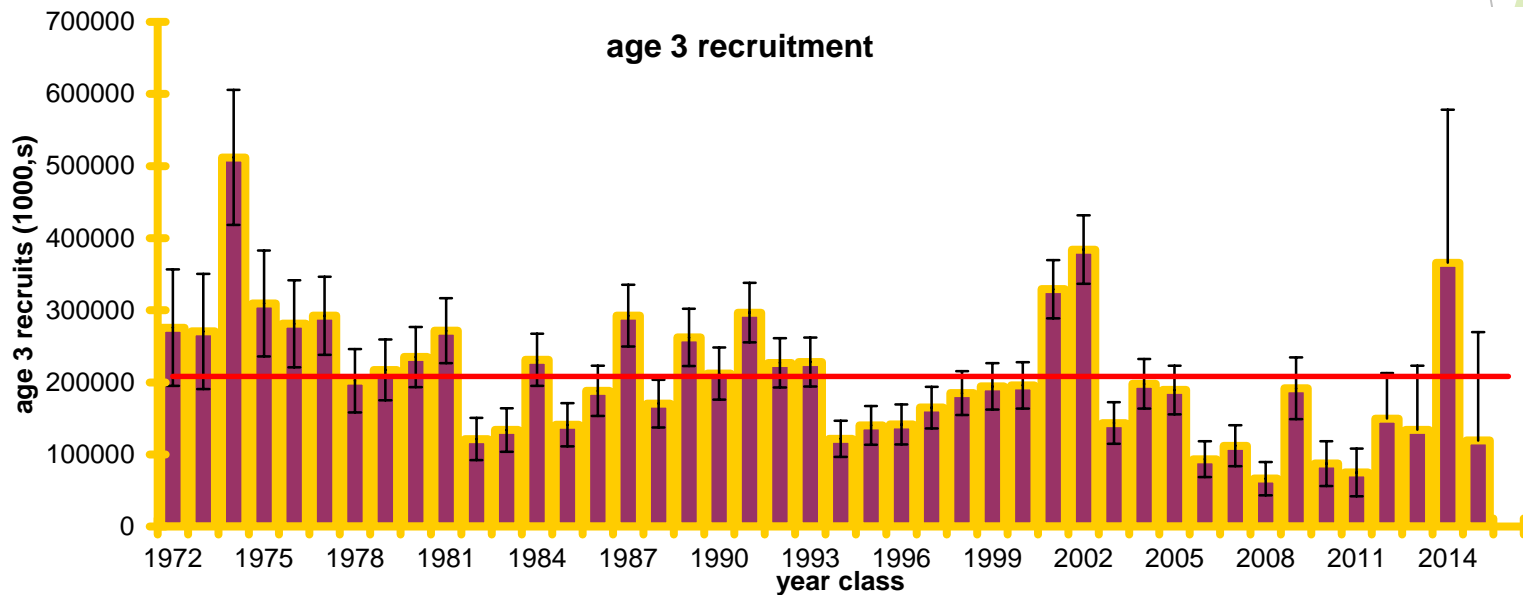
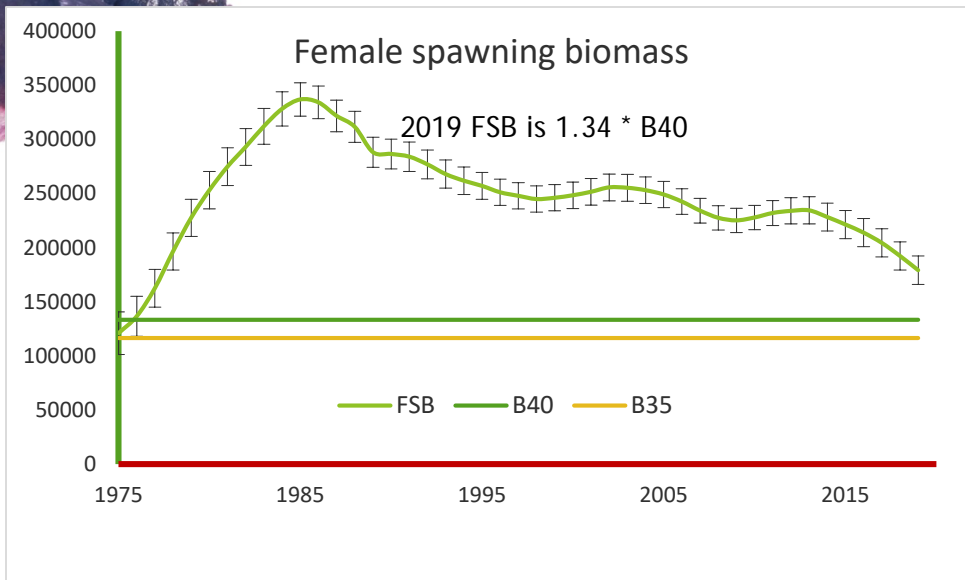
- ▶ Average age in the population (from model) is 8.7 for males and females



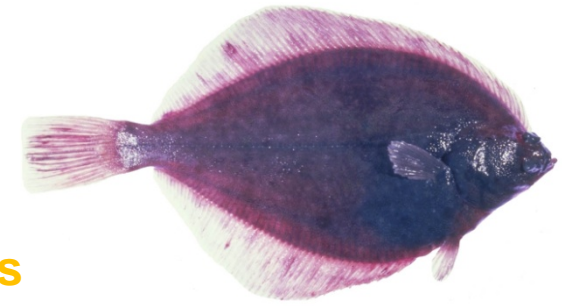
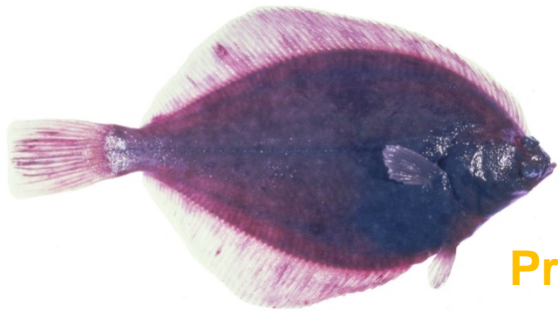
- ▶ Model estimate of average age in the catch is 14.5 for males and females



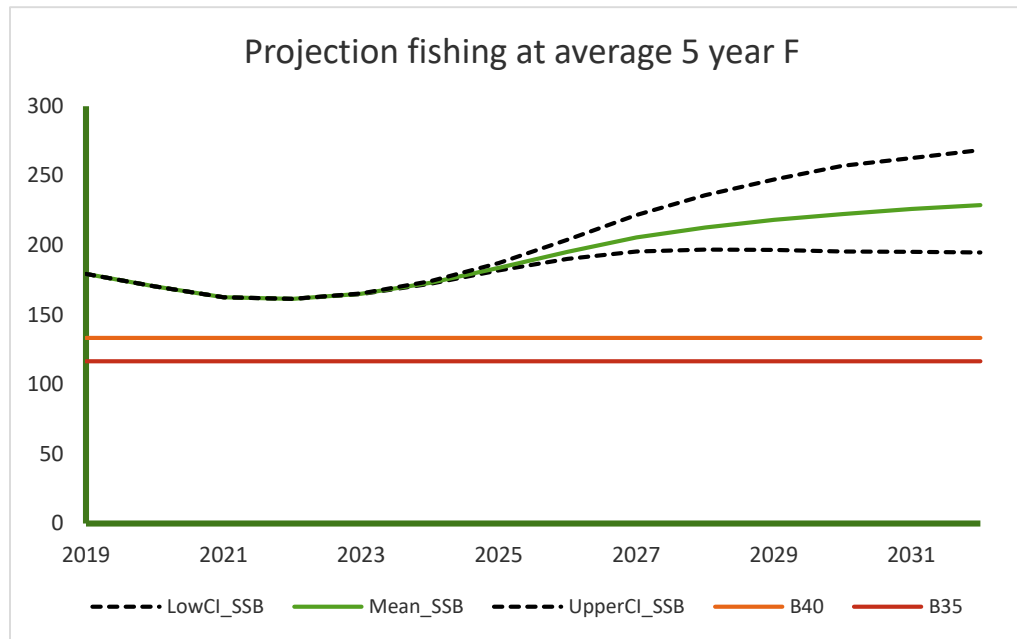
# Model results

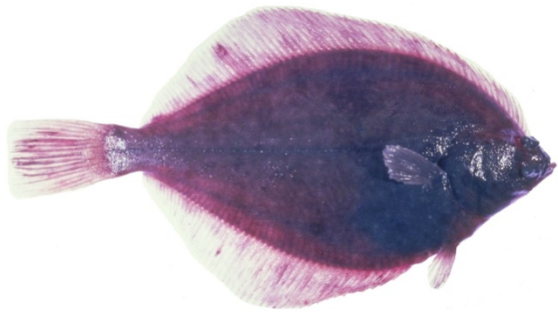






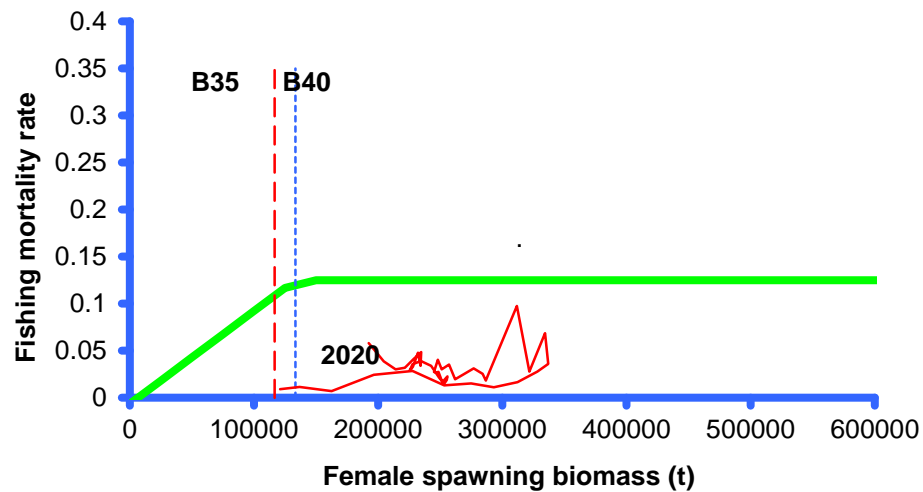
## Projected female spawning biomass

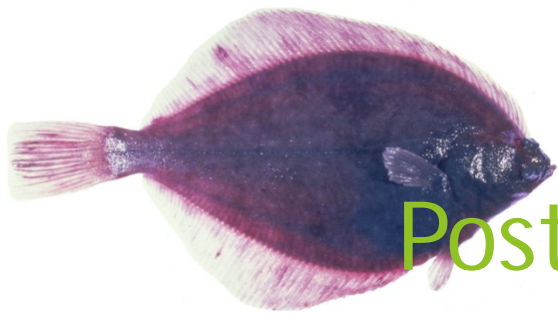




## Historical relationship between Fishing mortality and female spawning biomass and the biological reference points.

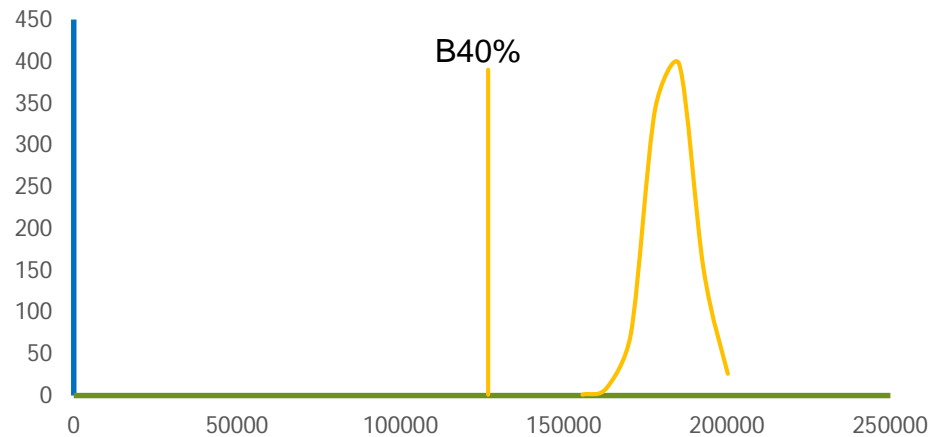
BSAI Alaska plaice

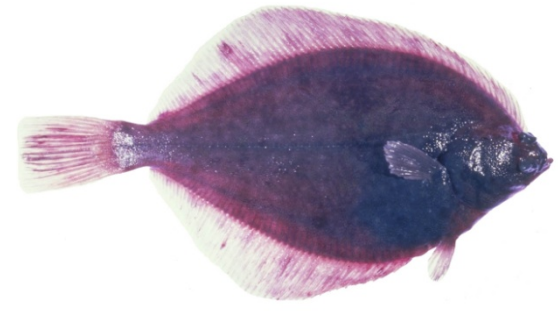
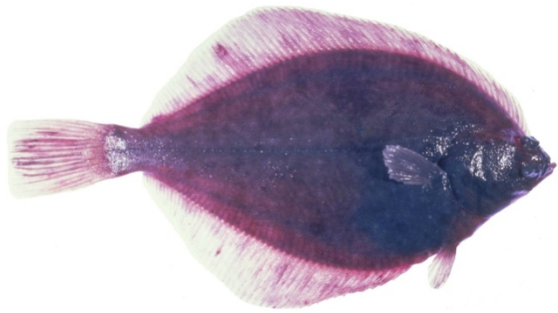




# Posterior distribution of female spawning biomass

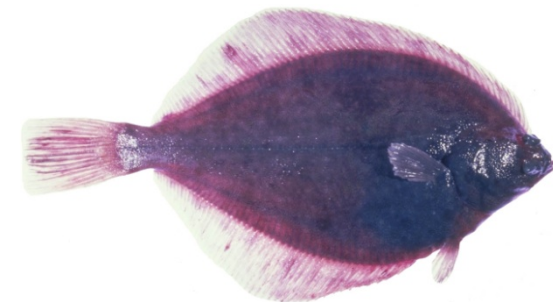
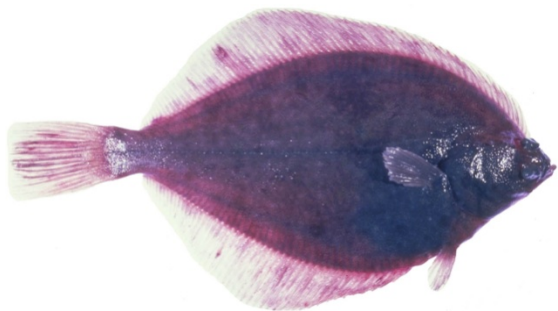
2019 estimate of posterior distribution of female spawning biomass (t)





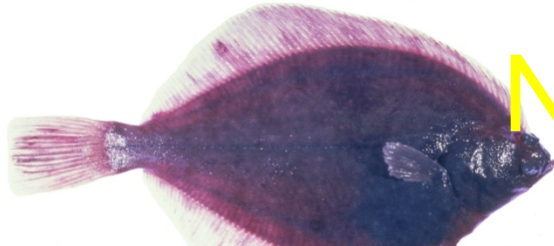
Alaska plaice ABC, TAC and catch



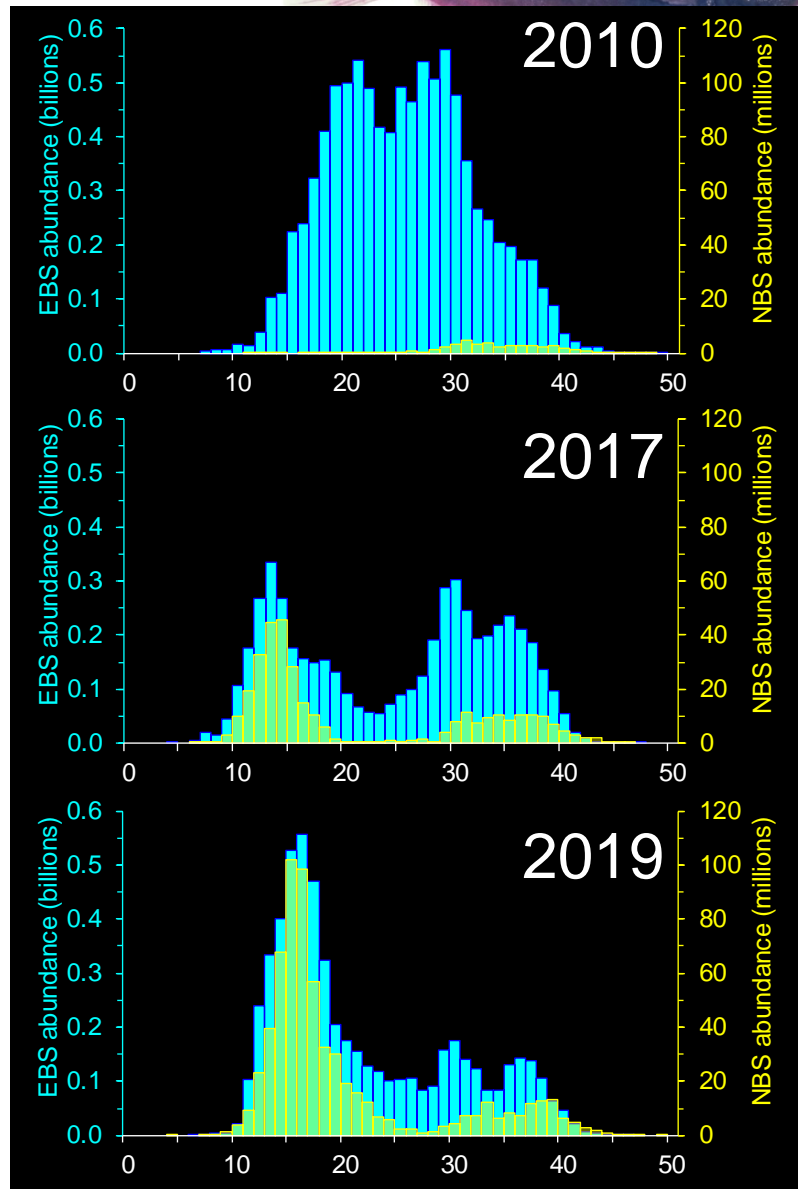
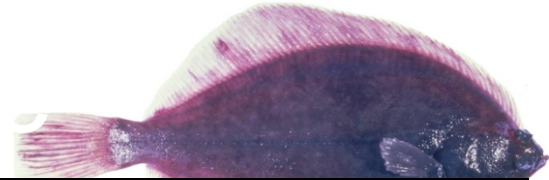
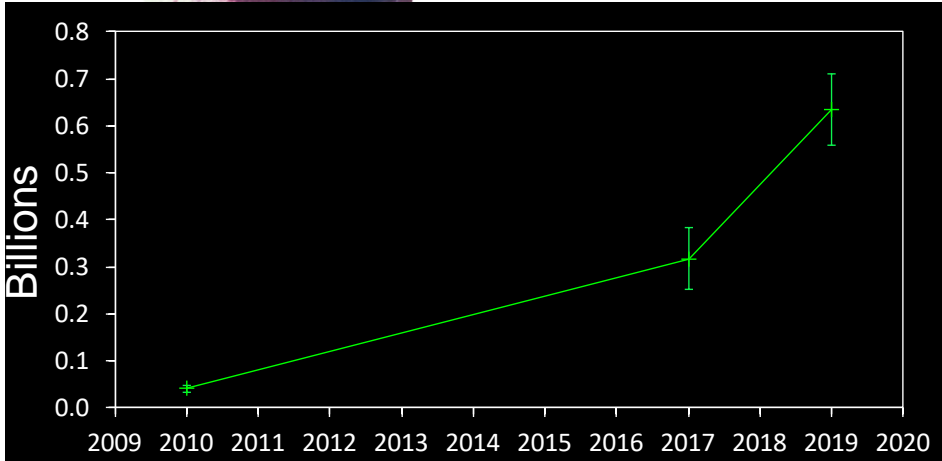


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Projected total (3+) biomass (t)	400,700	394,700	428,800	435,700
Female spawning biomass (t)	186,100	171,100	170,800	161,000
$B_{100\%}$	317,360	317,360	333,300	333,300
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OFL (t)	39,880	37,860	37,600	36,500
maxABC (t)	33,600	31,900	31,600	30,700
ABC (t)				
Status	As determined last year for:		As determined this year for:	
	2017	2018	2018	2019
Overfishing	no	n/a	No	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

ABC down 6% from last year.



NBS



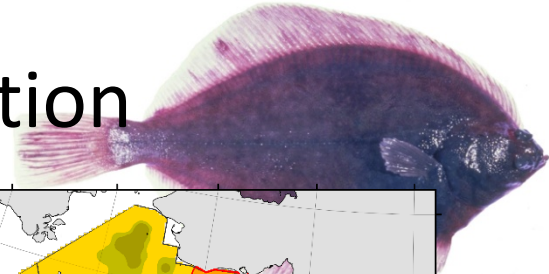
NBS

+100%

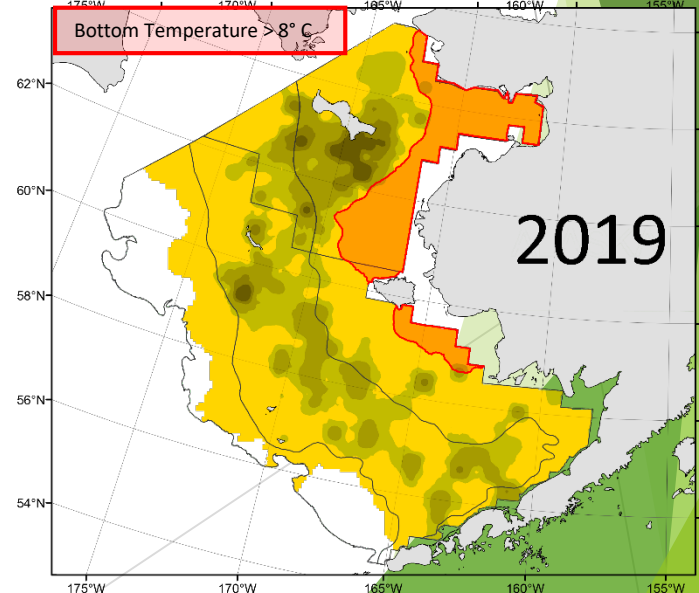
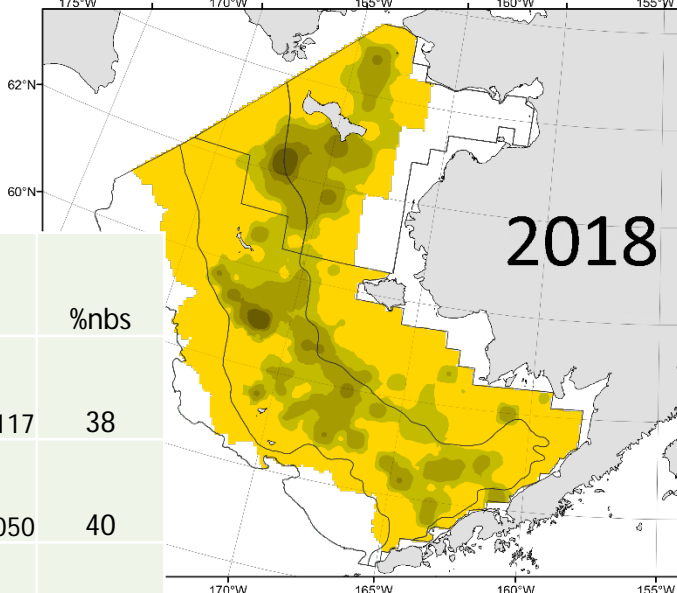
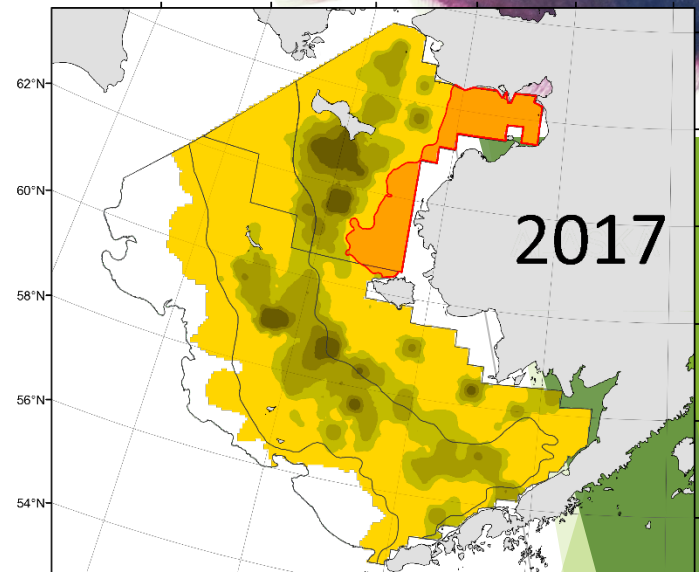
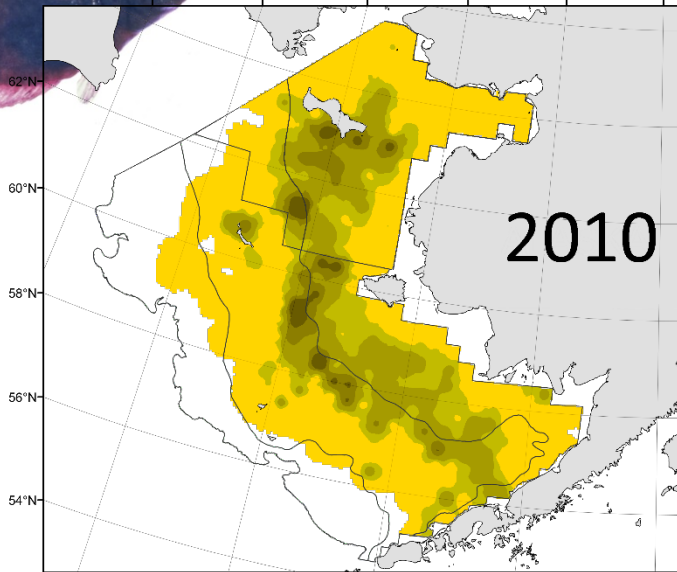
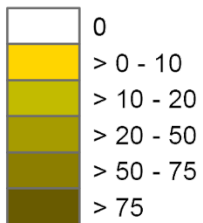




# Bering Sea Alaska Plaice Distribution



Alaska plaice  
(kg/ha)



	nbs	ebs	%nbs
2010	303195	498117	38
2017	324264	491050	40
2019	322565	368787	47