Southeast Alaska Red King Crab Stock Assessment

King and Tanner Task Force Mtg.
December 13, 2018

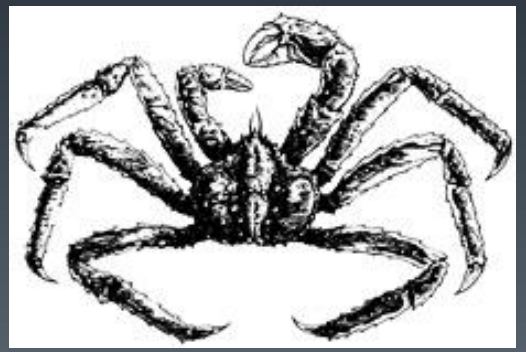


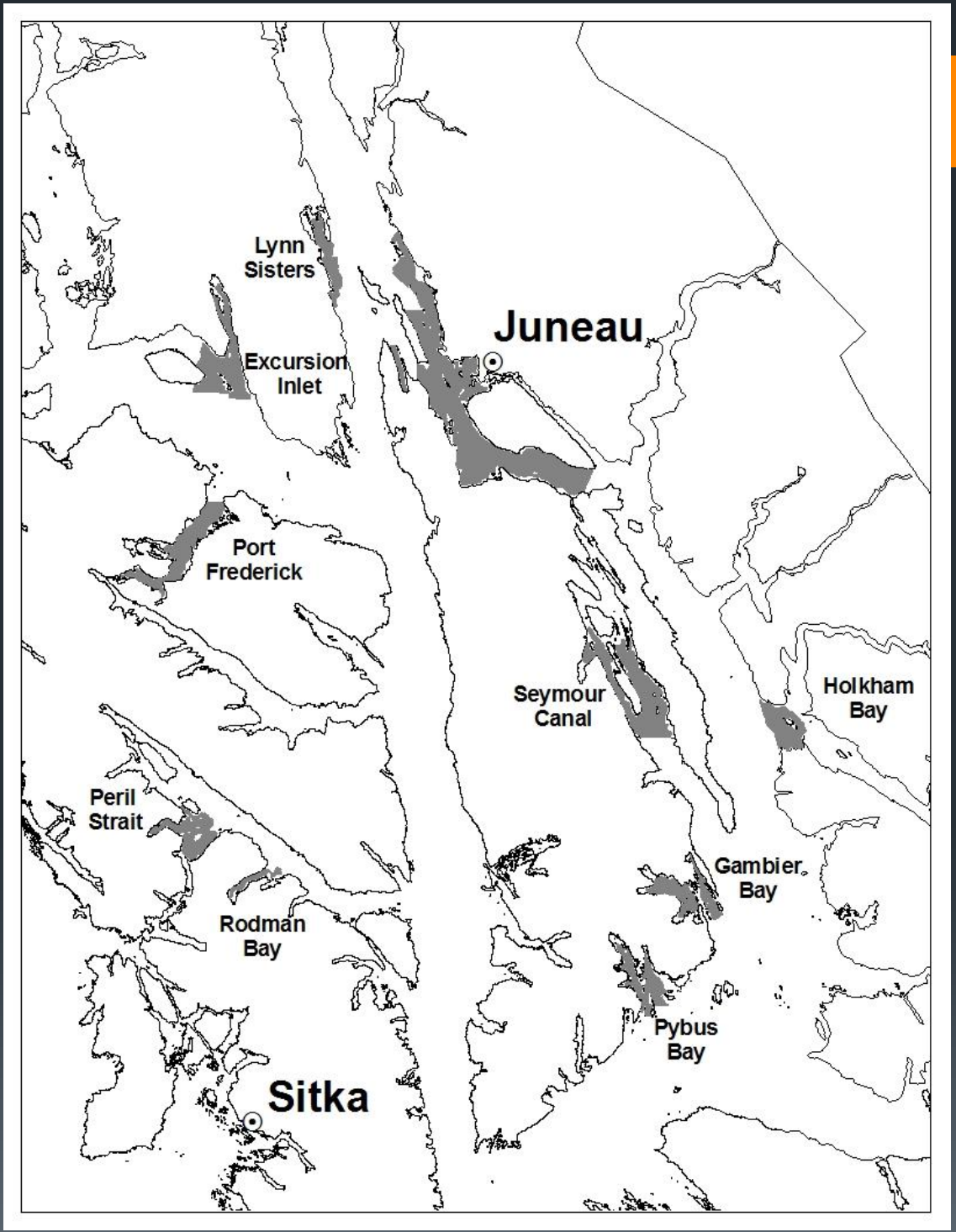
Image: northpacificseafoods.com

RKC Assessment / Management

- Assessment
  - 7 areas surveyed with ~517 pot lifts
  - Biomass estimated using Catch-Survey Analysis (CSA) model
- Management plan
  - Season November 1 – January 24
  - Appropriate harvest rate
  - Regional GHL set using survey biomass
  - Pot limits based on GHL
    - Ex. 200,000 GHL = 20 pot limit per vessel
  - Minimum GHL threshold of 200,000 lbs legal crab
  - Mark/Recapture expansion factor incorporated into biomass estimate
  - Males only, 7-inch minimum CW

Southeast Alaska

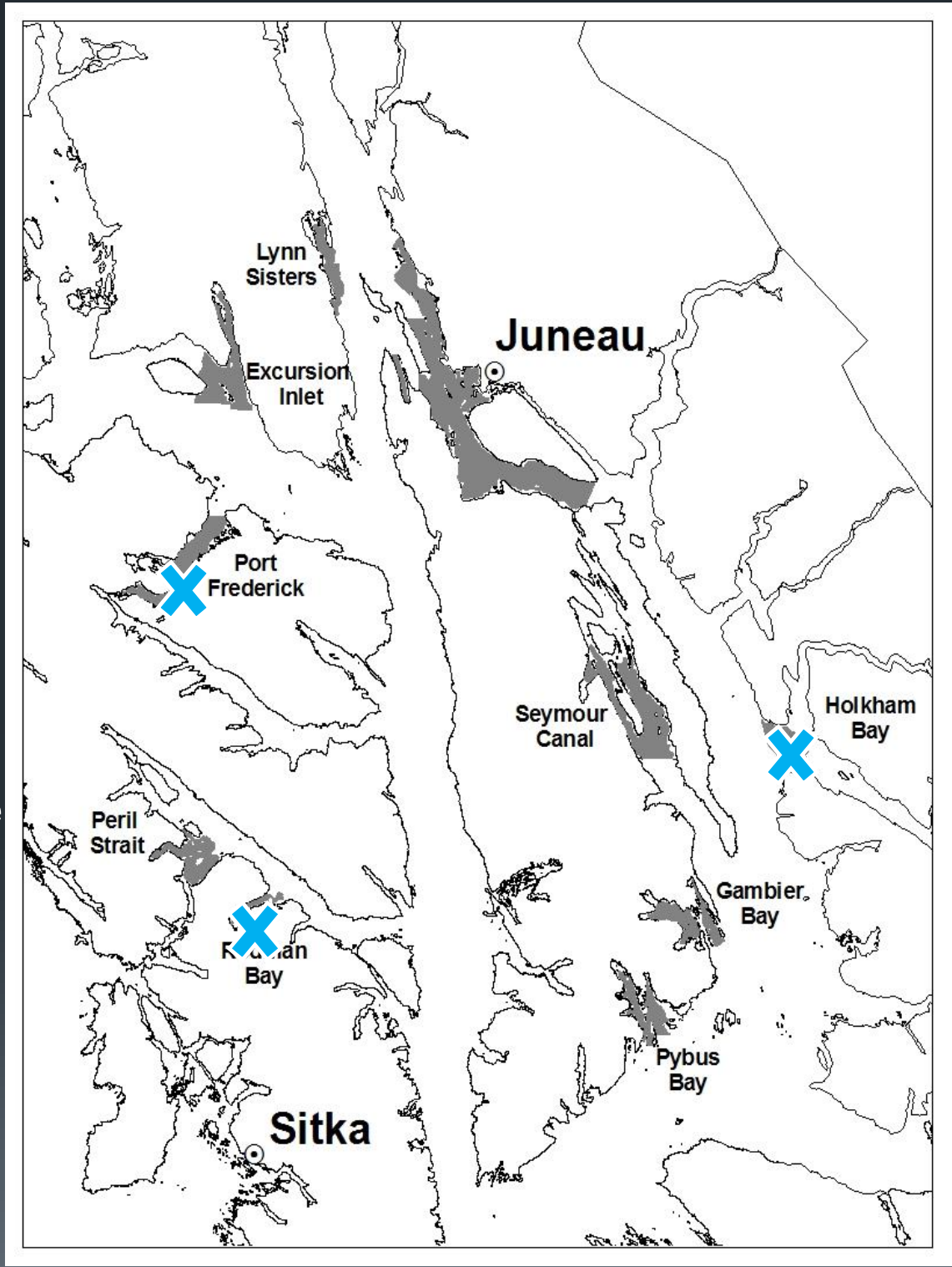
Major Commercial Red King Crab Fishing Grounds



Southeast Alaska

2015 Survey Updates:

- Budget reductions caused survey sources to be re-allocated into historically more important survey areas
- Port Frederick, Holkham Bay, and Rodman Bay removed due to historically low catch rates and abundance
- No significant impact on biomass estimate

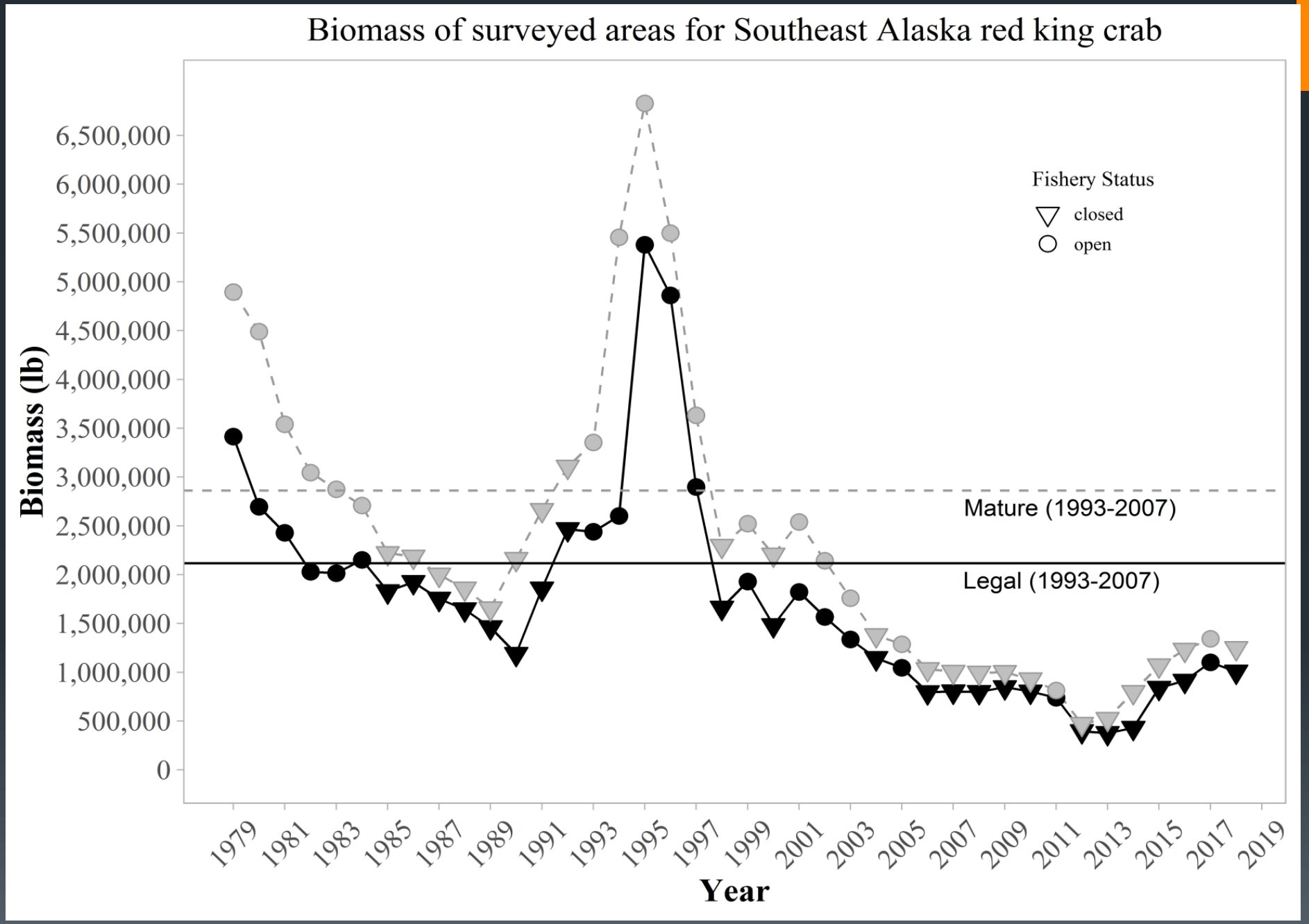


2017 Fishery Summary

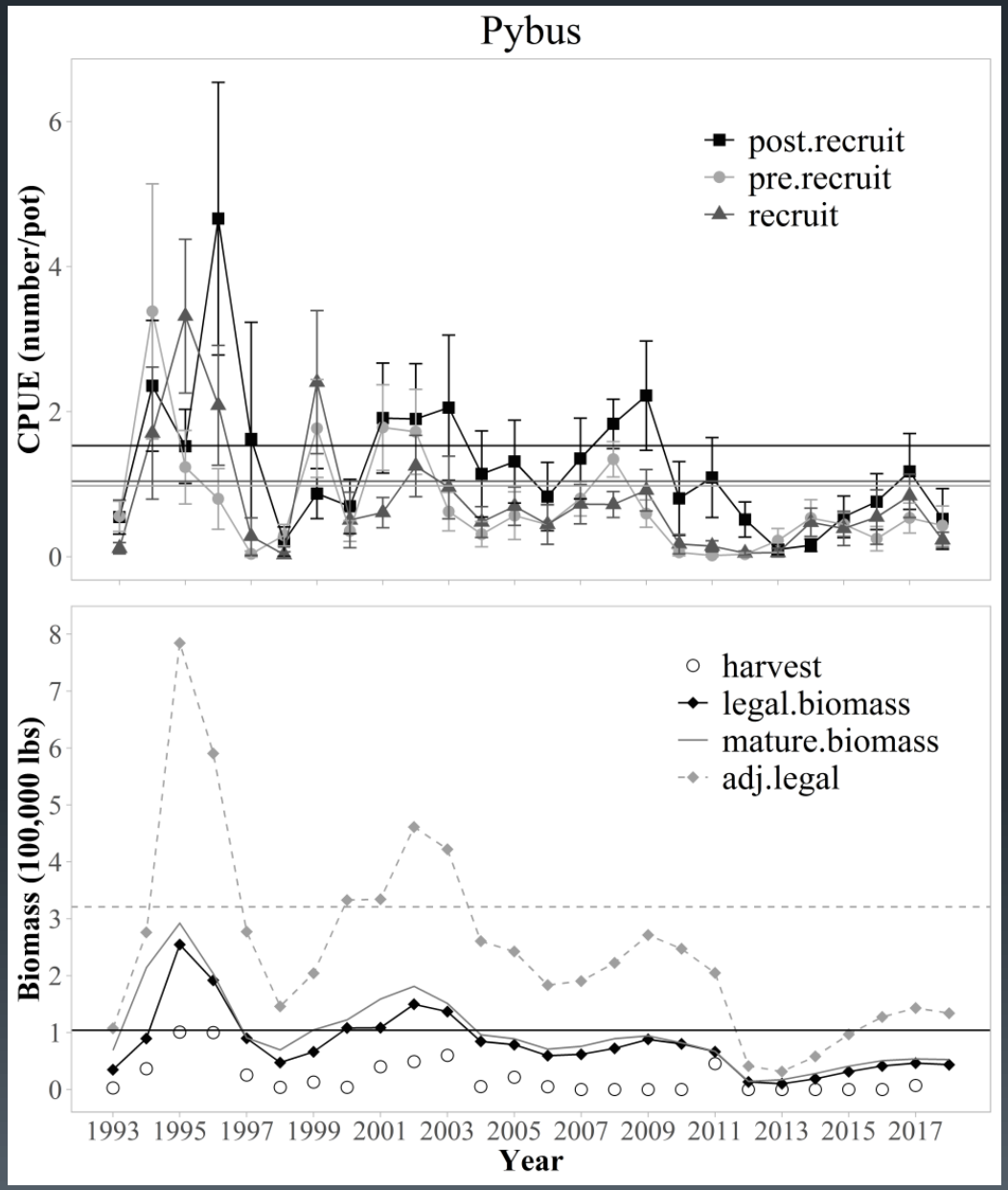
Management Area	GHL	Harvest (lb)	Estmate of % GHL Harvested	Number of Permits	Pot Lifts	Number of Crab	CPUE*
11-A Juneau	18,600	20,279	**109%**	13	360	2,516	6.98
Pybus/Gambier/Round Rock	20,000	9,207	**46%**	20	597	1,163	1.95
Seymour Canal	20,000	5,603	**28%**	5	129	703	5.45
Excursion	7,600	*	*	*	*	*	*
Northern Non-Surveyed Areas	100,000	85,075	**85%**	42	5,897	11,725	1.99
Southern Non-Surveyed Areas	35,000	*	*	*	*	*	*
Total	201,200	120,566	**60%**	48	7,065	16,160	2.29

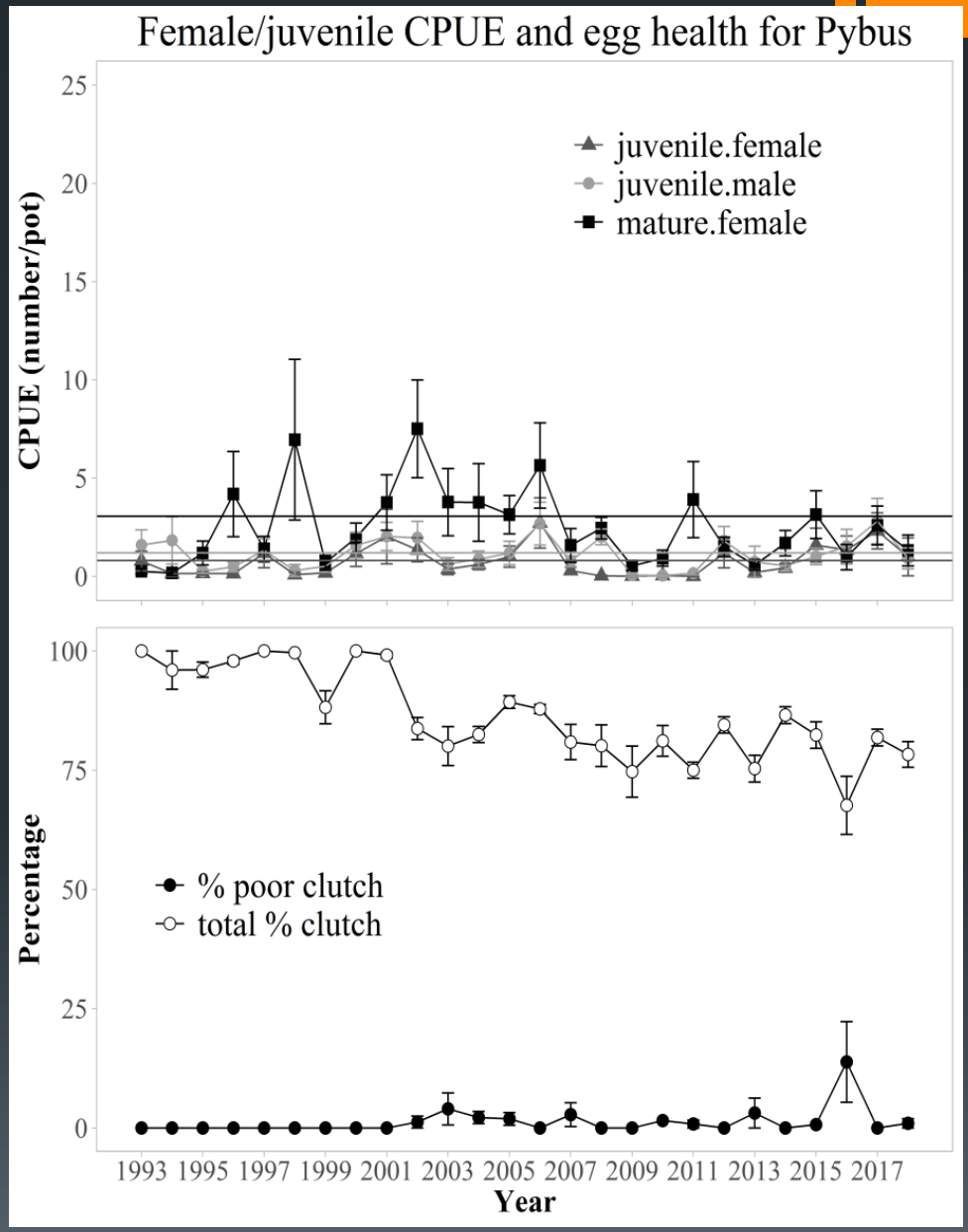
PU King Crab Permits

- New permit system put into place 7/1/18
- Permits due June 16th
- Statewide harvest survey from 2017: **527**
- Estimated harvest as of 12/11/18: **1,330**

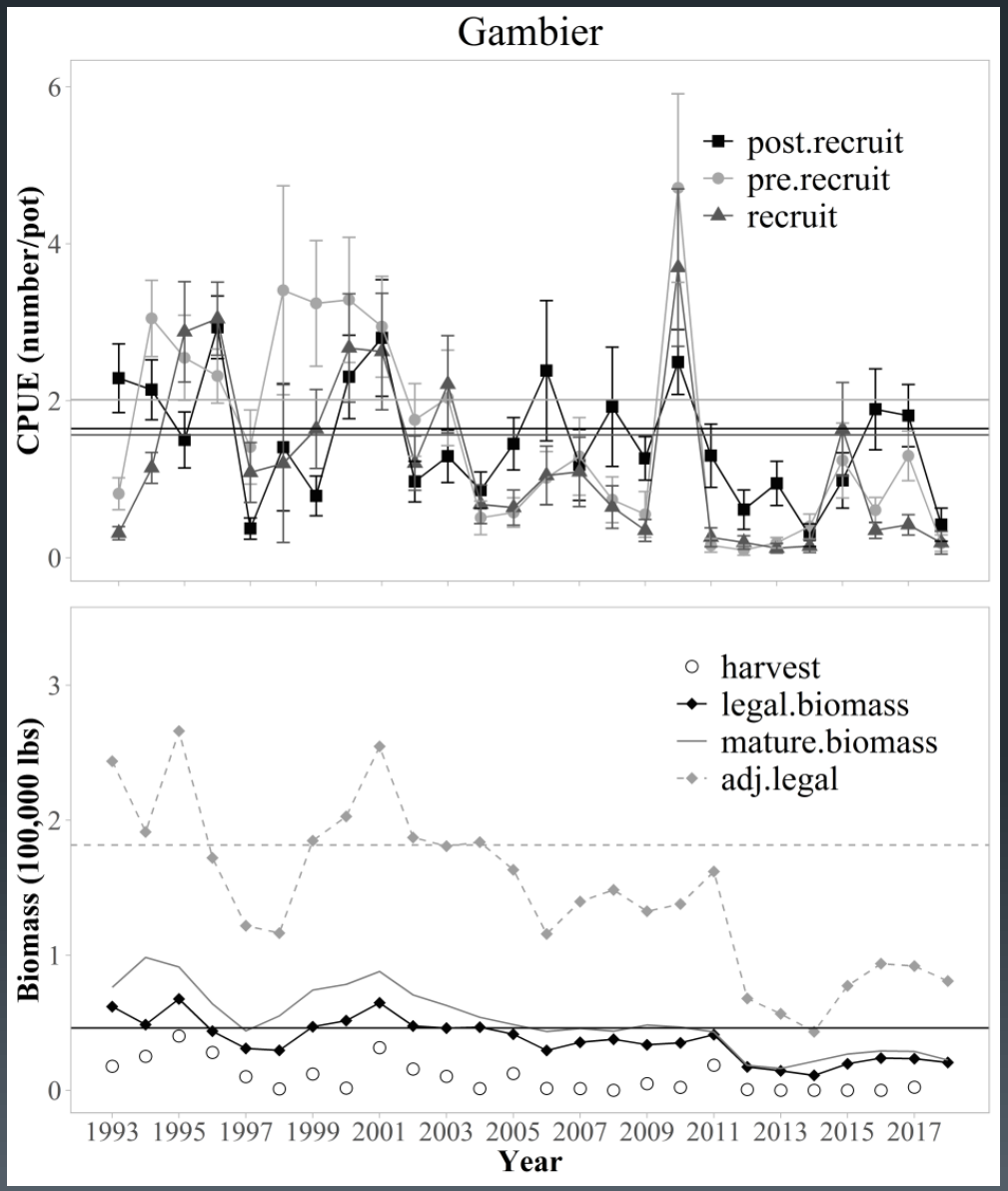

Biomass of surveyed areas for Southeast Alaska red king crab
Biomass (lb)
6,500,000
6,000,000
5,500,000
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Fishery Status
closed
open
Mature (1993-2007)
Legal (1993-2007)
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
2019
Year

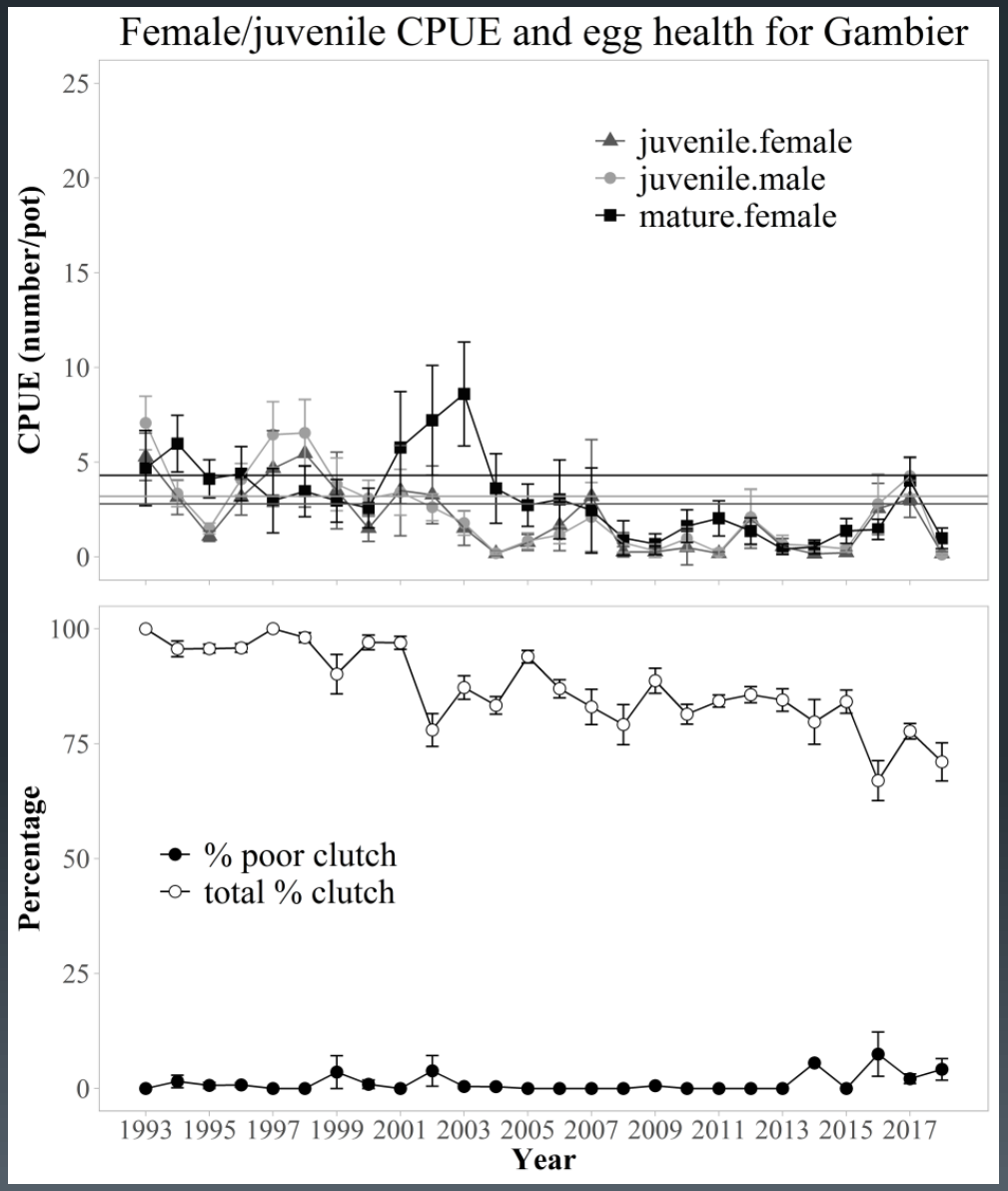
Pybus Bay


Pybus
post.recruit
pre.recruit
recruit
CPUE (number/pot)
harvest
legal.biomass
mature.biomass
adj.legal
Biomass (100,000 lbs)
1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
Year

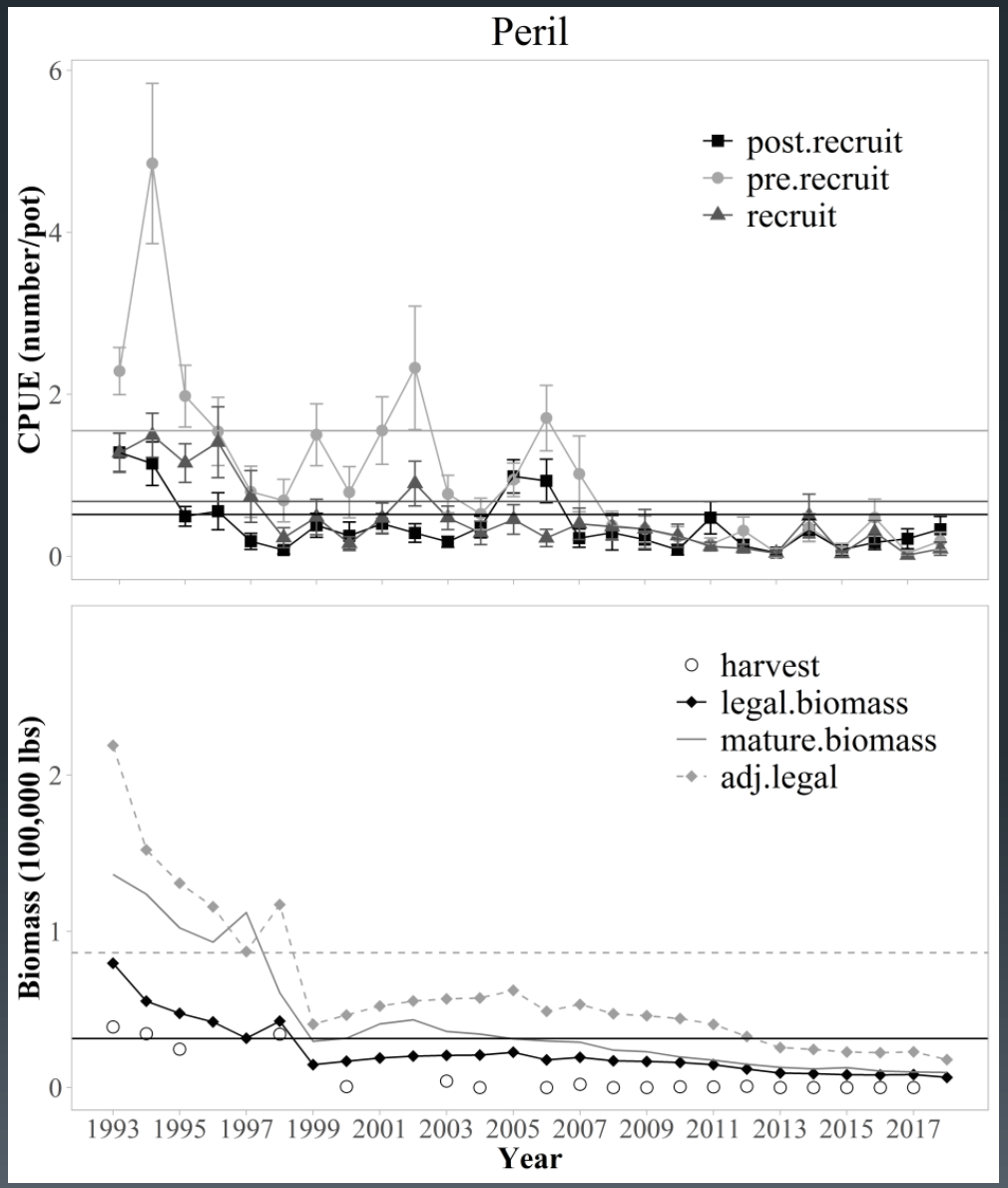

Female/juvenile CPUE and egg health for Pybus
juvenile.female
juvenile.male
mature.female
CPUE (number/pot)
% poor clutch
total % clutch
Percentage
1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
Year

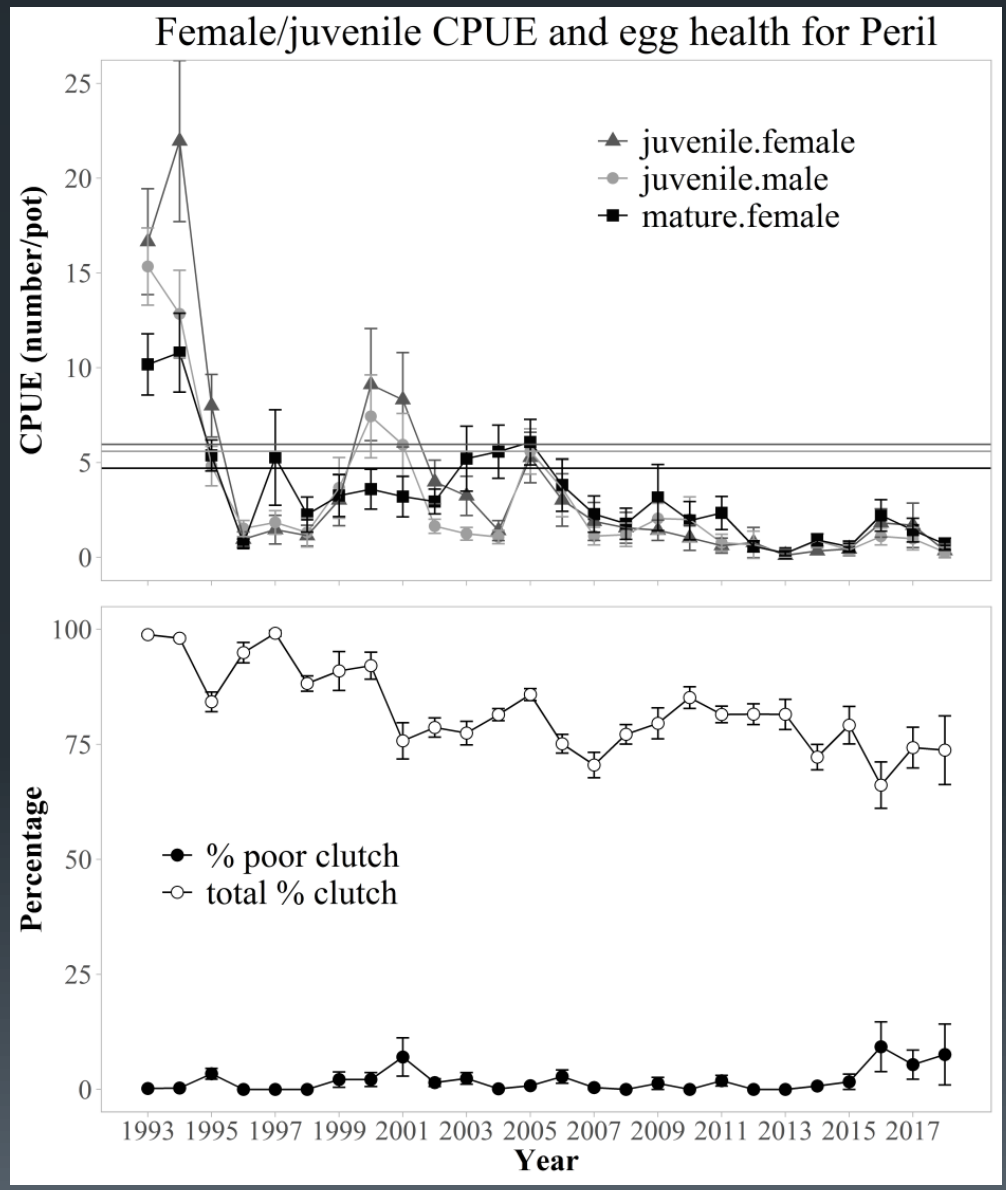
Gambier Bay


Gambier
CPUE (number/pot)
post.recruit
pre.recruit
recruit
Biomass (100,000 lbs)
harvest
legal.biomass
mature.biomass
adj.legal
1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
Year

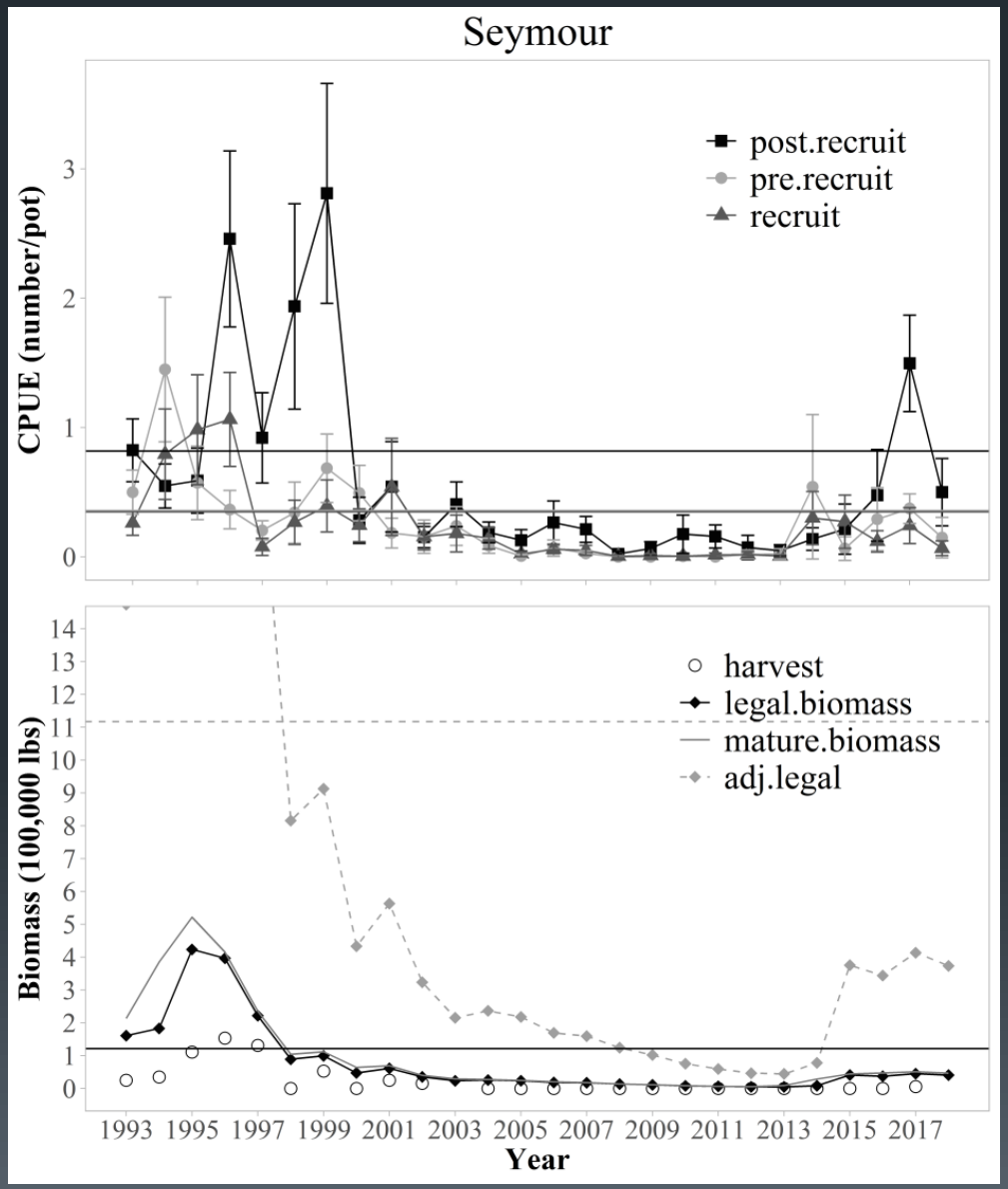

Female/juvenile CPUE and egg health for Gambier
CPUE (number/pot)
juvenile.female
juvenile.male
mature.female
Percentage
% poor clutch
total % clutch
1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017
Year

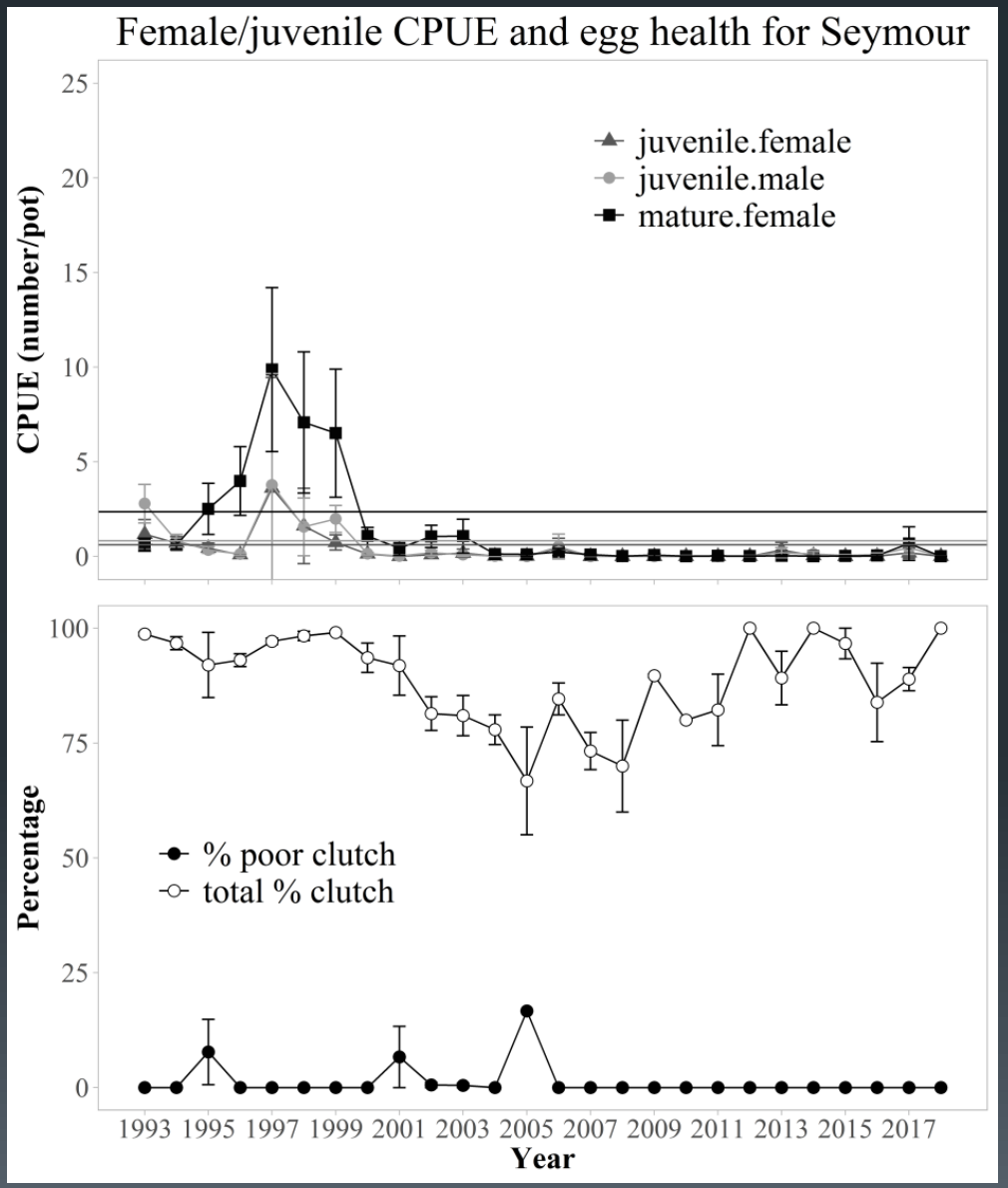
Peril Strait



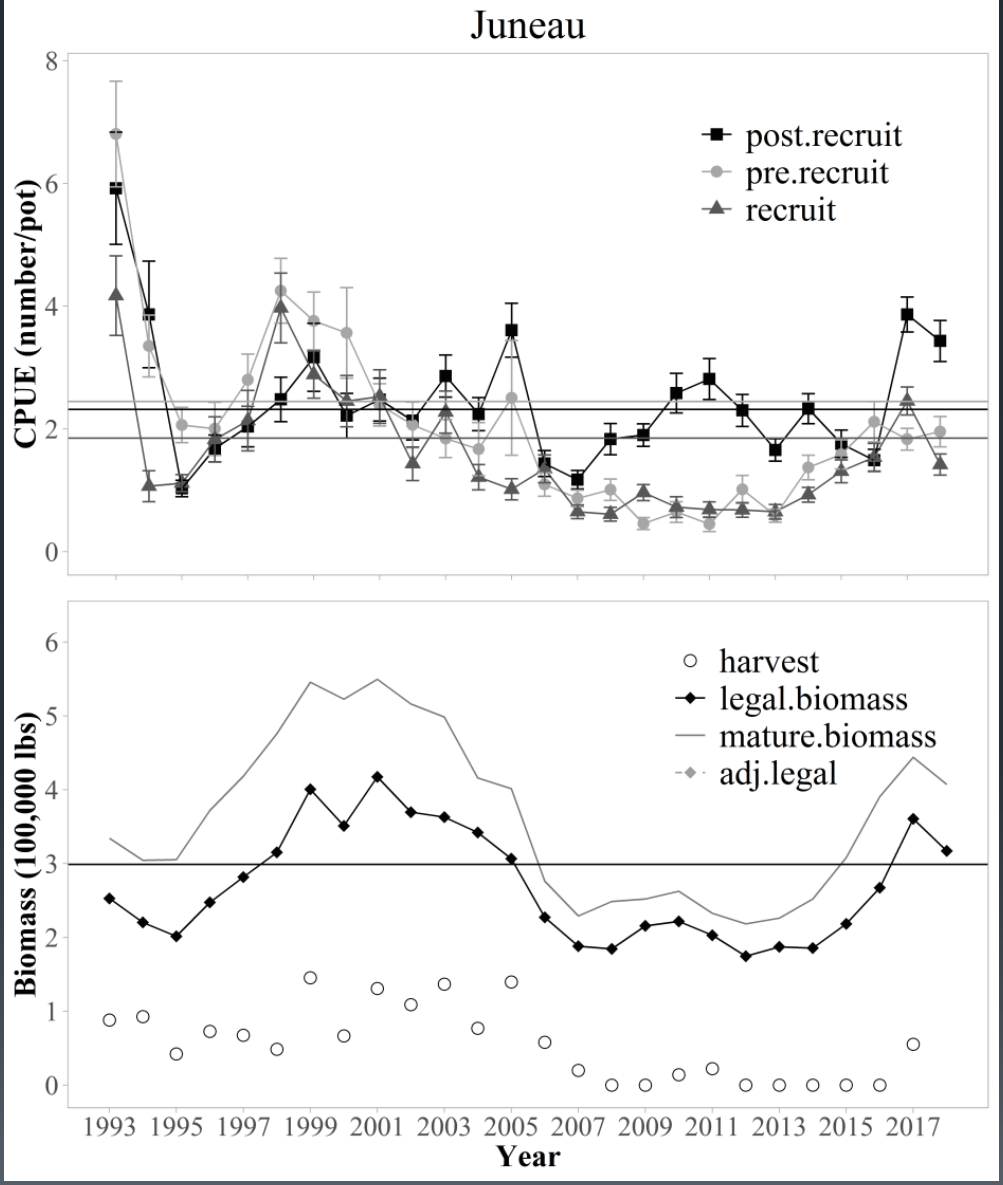


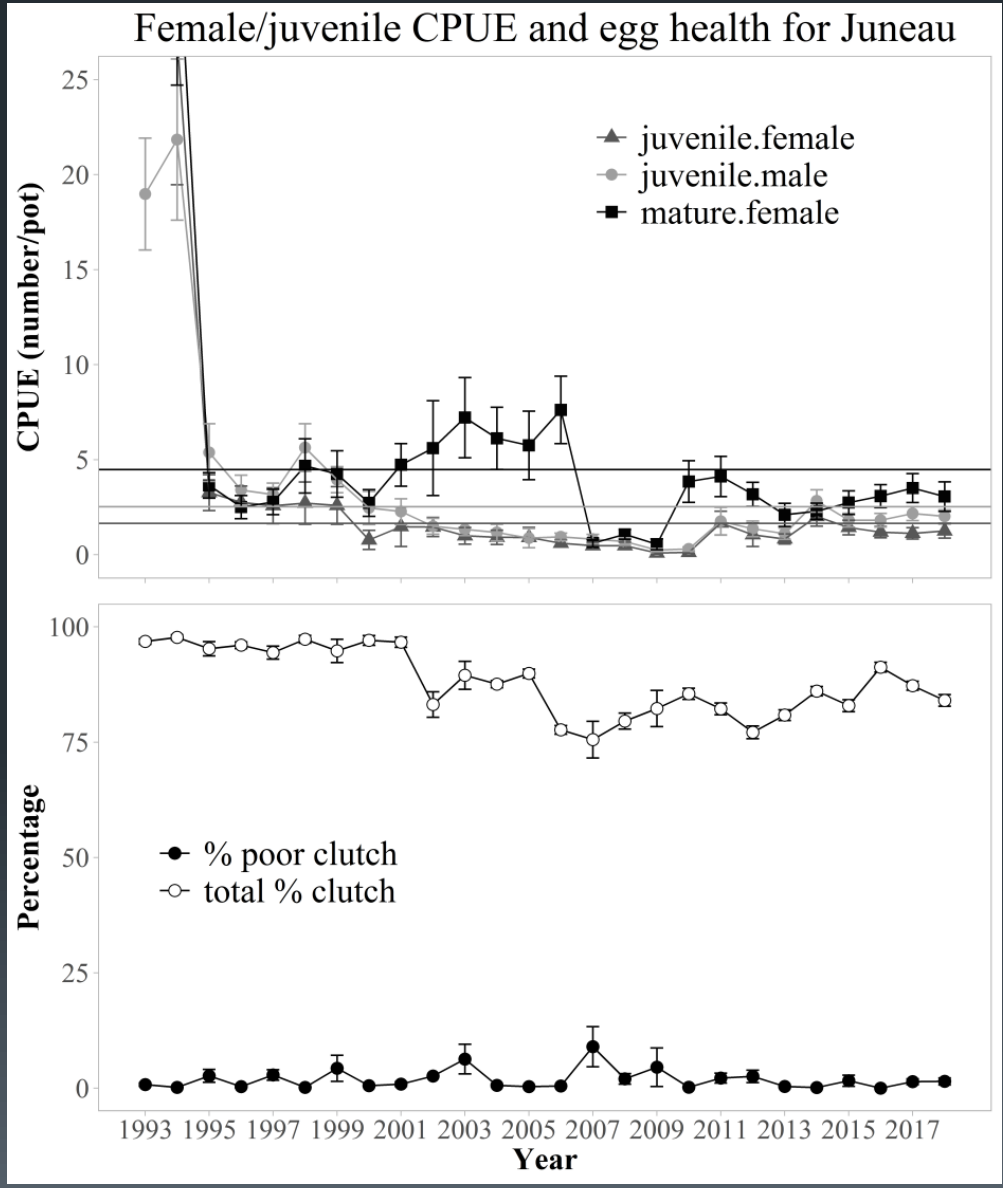
Seymour Canal



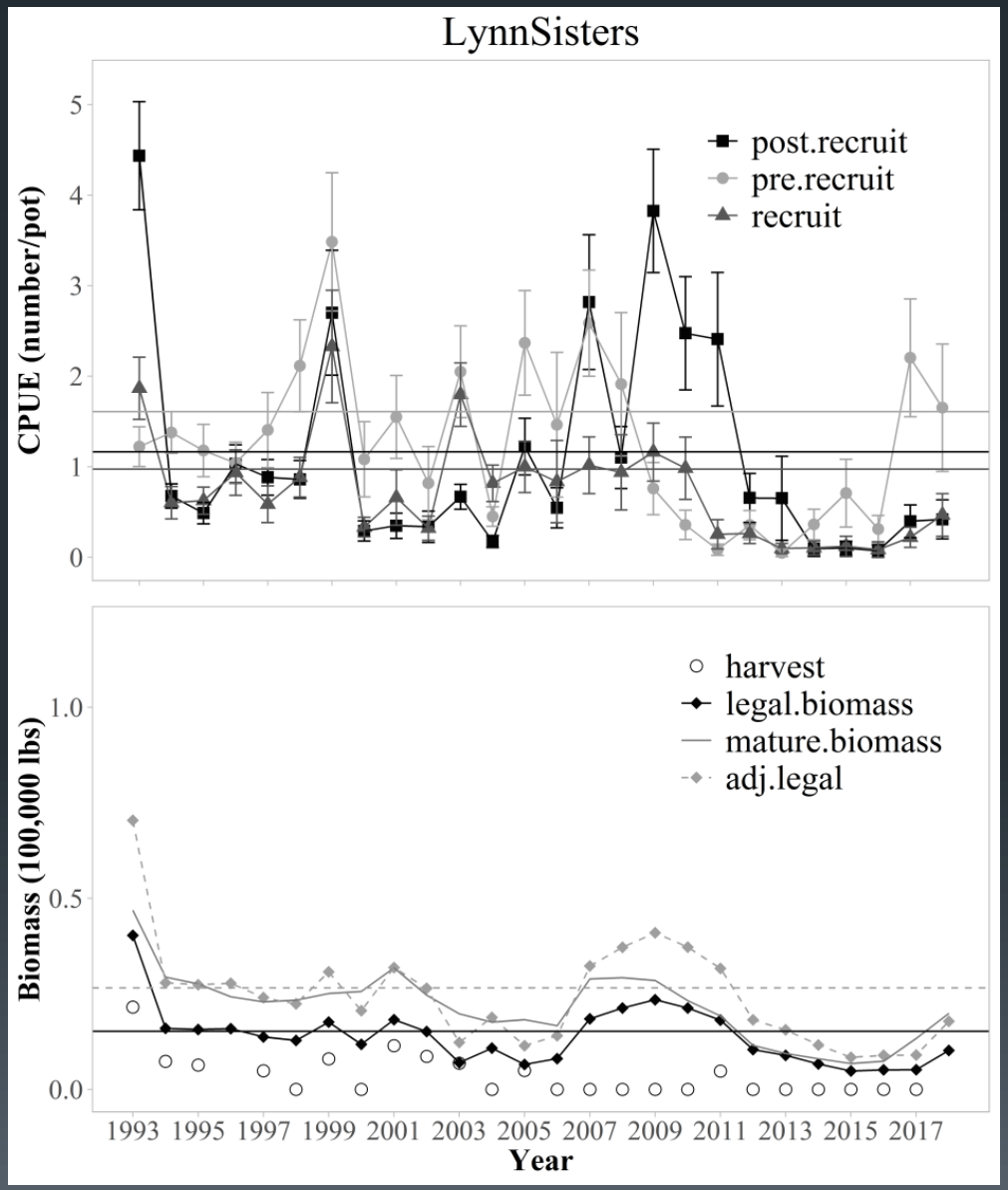


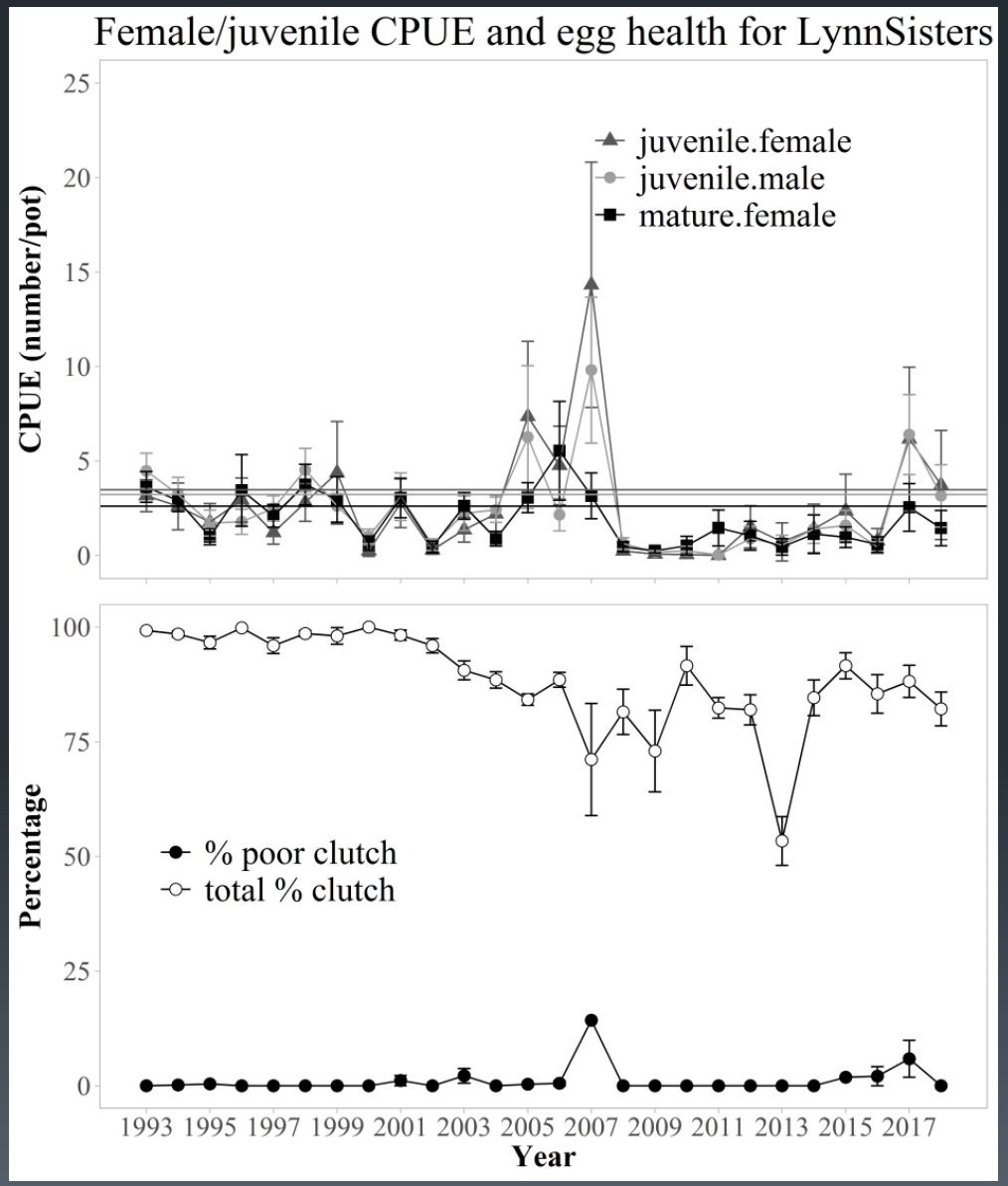
Juneau Area


Juneau
CPUE (number/pot)
post.recruit
pre.recruit
recruit
Biomass (100,000 lbs)
harvest
legal.biomass
mature.biomass
adj.legal
Year

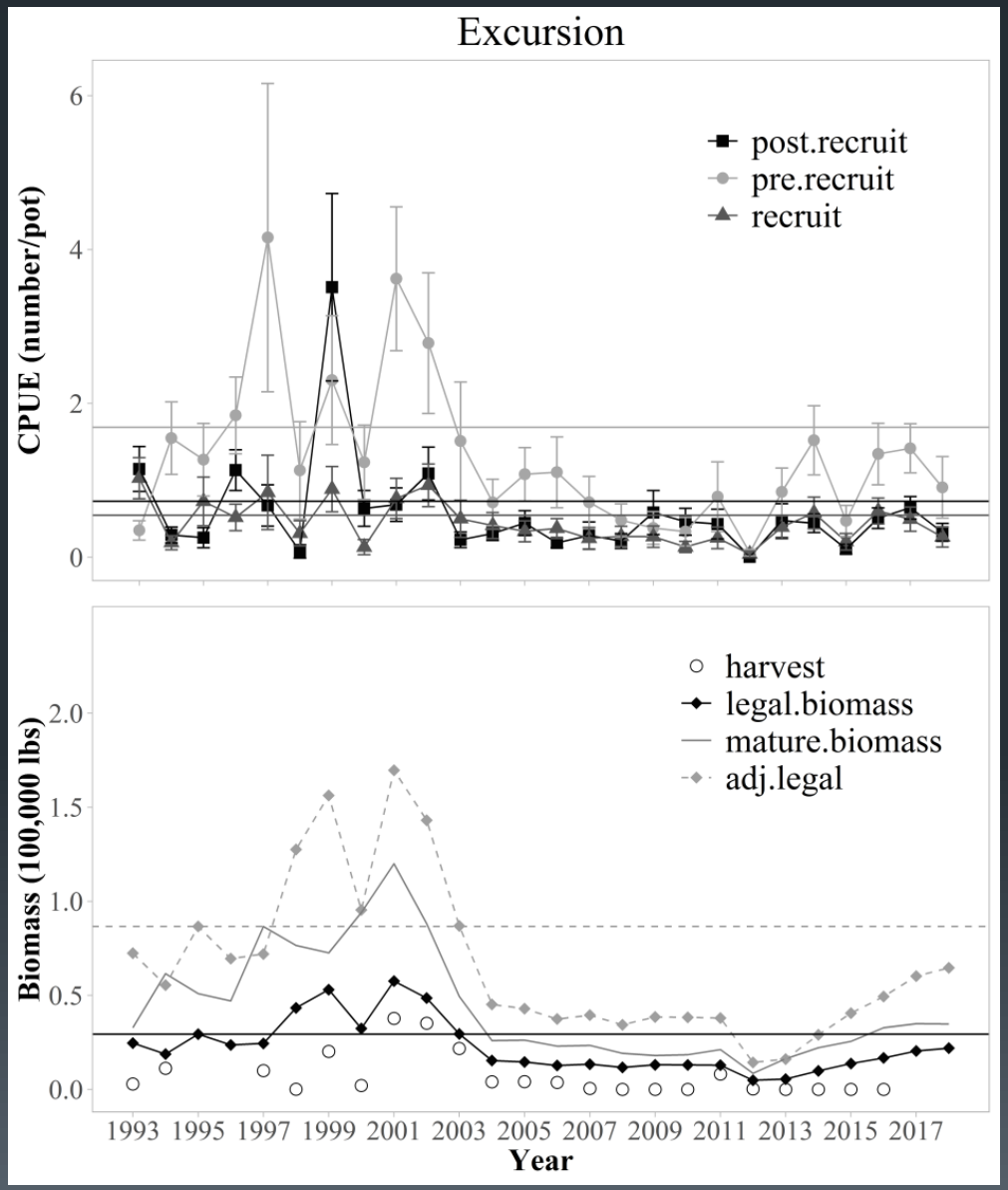

Female/juvenile CPUE and egg health for Juneau
CPUE (number/pot)
juvenile.female
juvenile.male
mature.female
Percentage
% poor clutch
total % clutch
Year

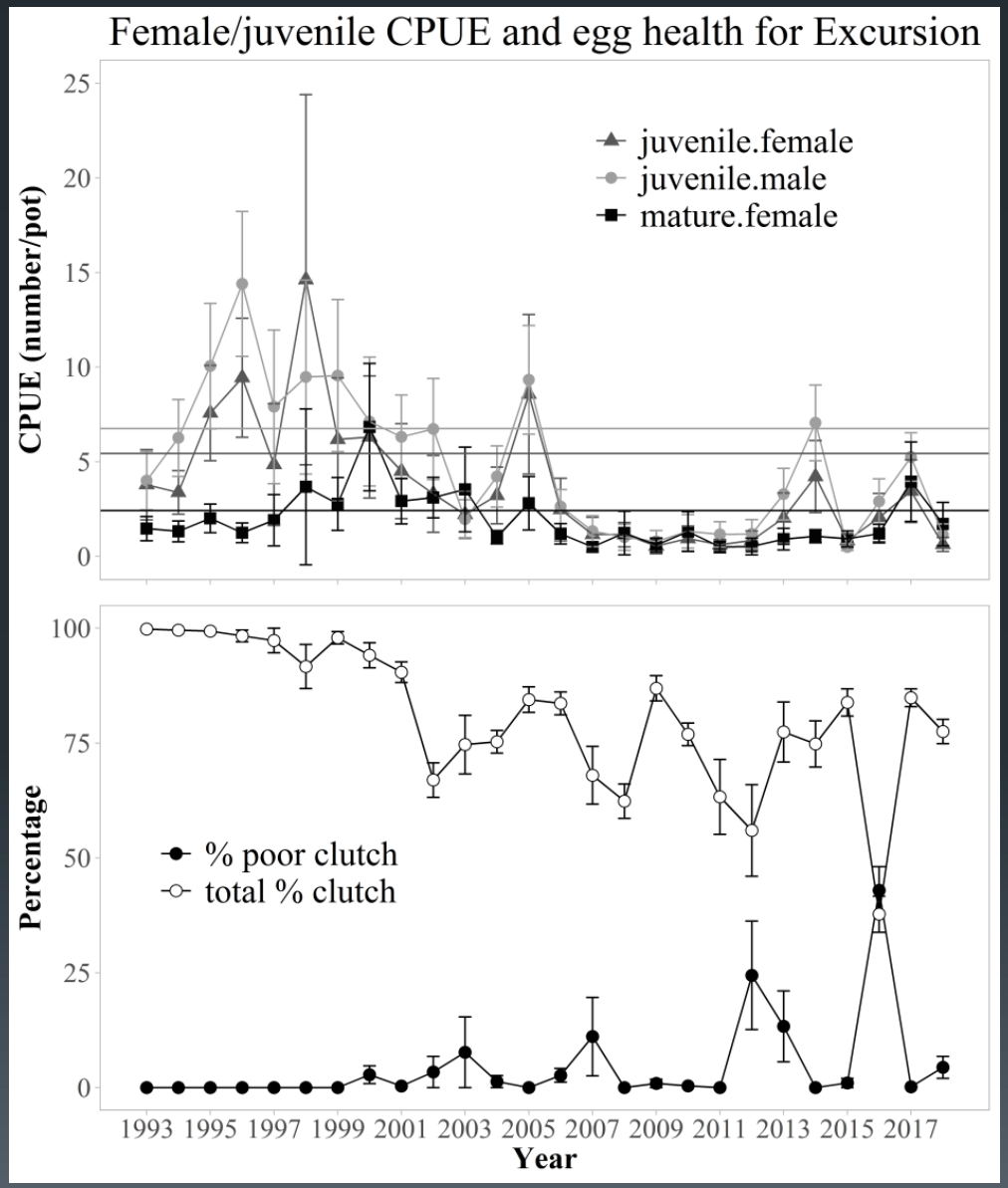
Lynn Sisters





Excursion Inlet





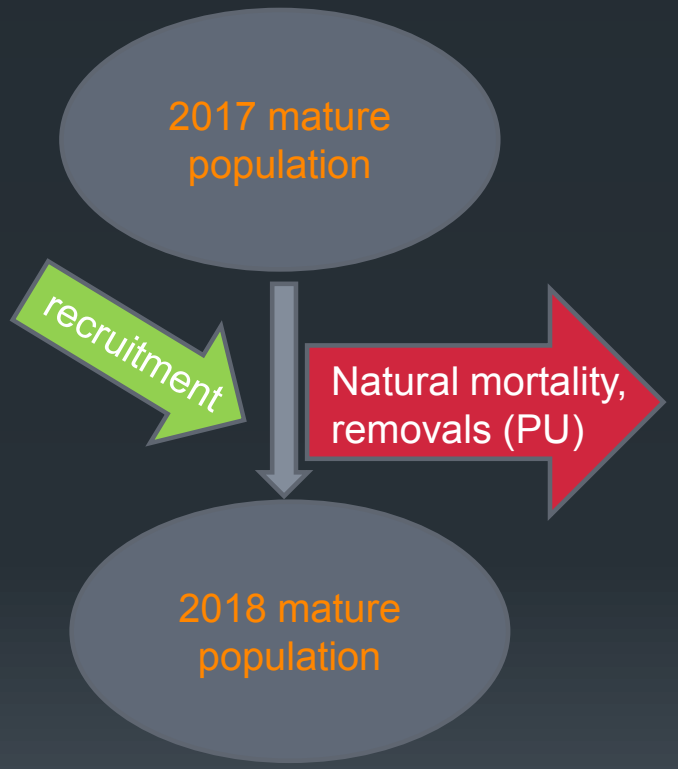
Survey area	CSA Biomass of Legal Crab	CSA Biomass of Mature Crab	Mature biomass	Mature harvest rate	Total GHL	Personal use catch	2018 Commercial GHL
Pybus Bay	43,512	52,526	**161,814**	12.0%	19,418	0	19,418
Gambier Bay	20,599	22,372	**87,905**	0.0%	0	0	0
Seymour Canal	40,707	46,637	**427,879**	2.0%	8,558	0	8,558
Peril Strait	6,501	9,705	**26,720**	0.0%	0	0	0
Juneau Area	317,185	407,156	**407,156**	8.0%	32,572	19,543	13,029
Lynn Sisters	10,209	19,914	**34,786**	0.0%	0	0	0
Excursion Inlet	21,942	34,763	**102,406**	6.0%	6,144	0	6,144
Other Areas	411,798	530,171	**1,116,232**	10.0%			111,623
Blue King Crab	4,891	6,297	**13,259**				0
Total	877,344	1,129,542	**2,378,156**				158,772

RKC Harvest Rate

Appropriate harvest rate?

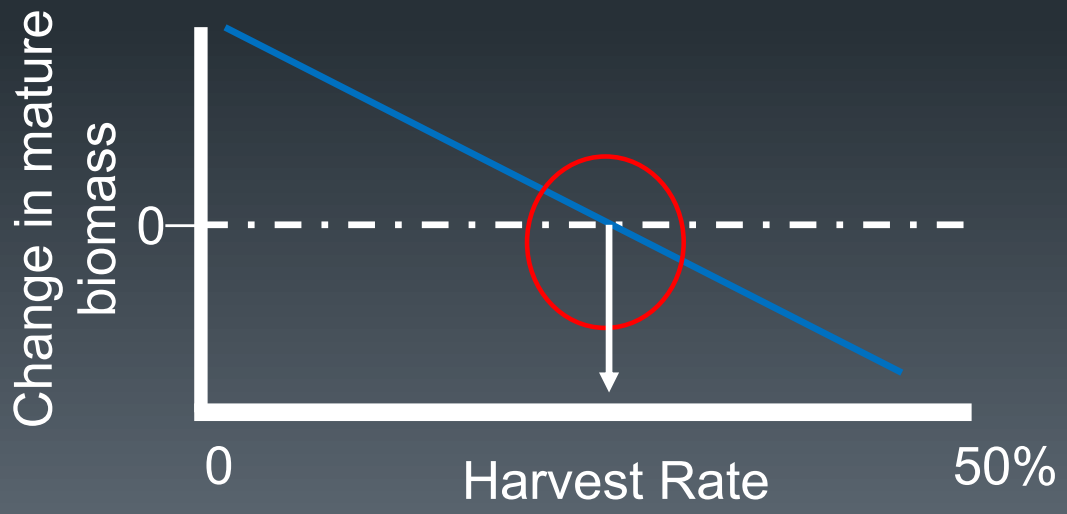
- Data available:
  - Historic applied harvest rates
  - Population growth (change in mature biomass)
    - Mark-recapture adjusted biomass estimates used

- 3 approaches:
  - 1: risk neutral
  - 2: high risk
  - 3: low risk



1: Neutral risk - Empirical method

- Model a linear relationship (harvest rate vs. change in mature population)
- Increased harvest rate would lead to decreased biomass
- Change in biomass = 0, the removal from harvest would be balanced by the recruitment into the fished population.
- In a stable population – with consistent recruitment – this harvest rate would be sustainable over time with minimal effects on the overall population biomass

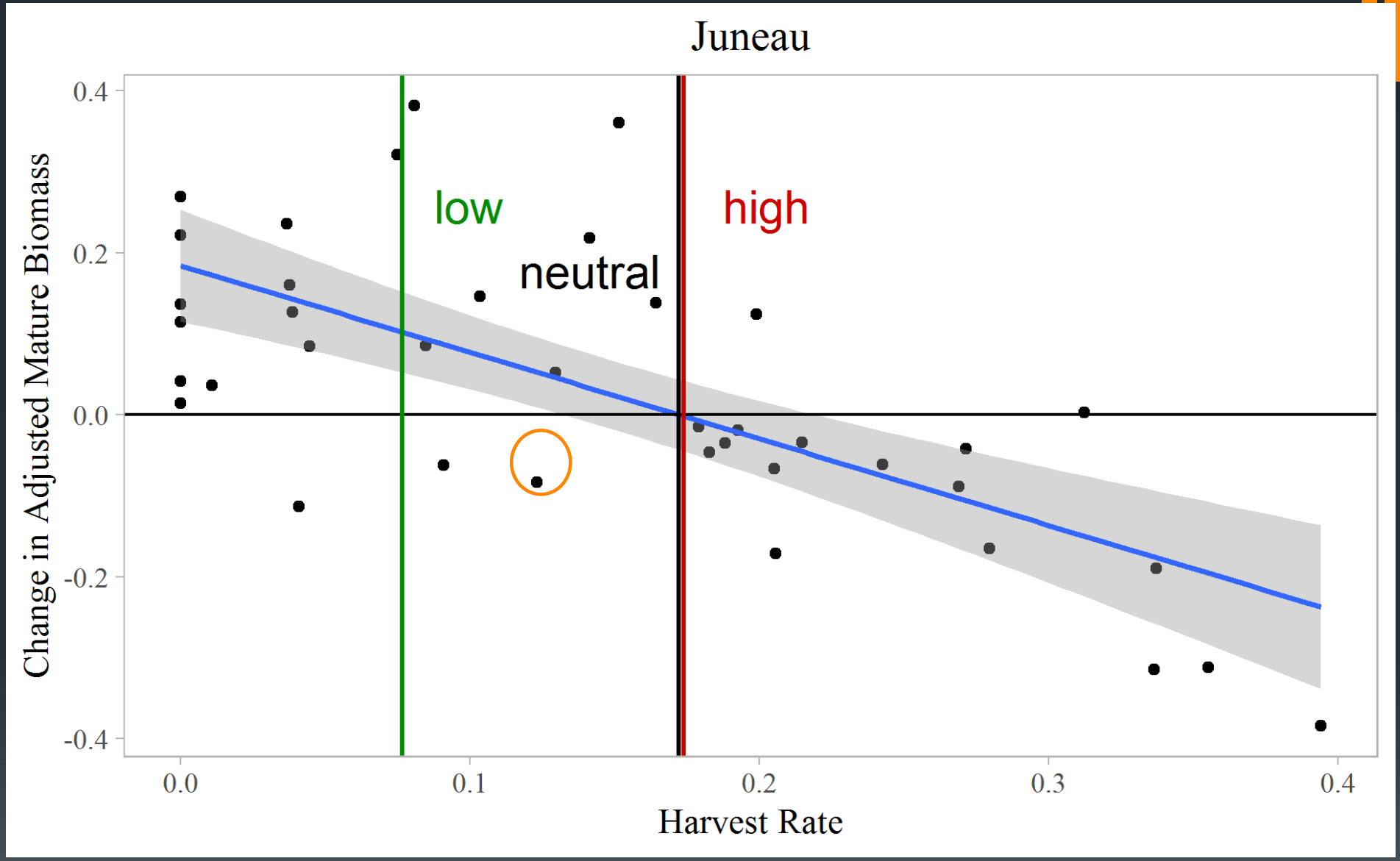


2: High risk - Averages

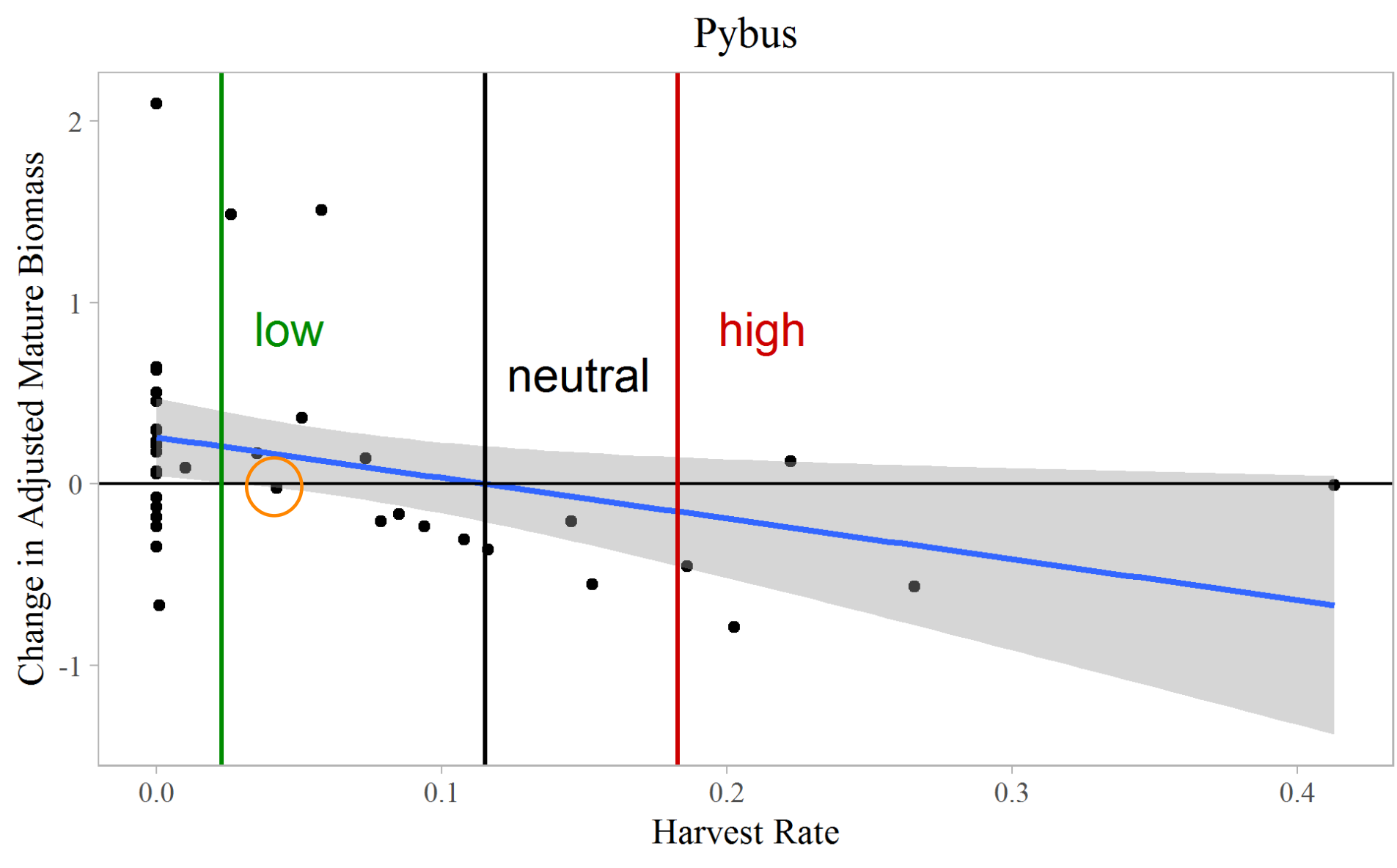
- Average harvest rate and average change in mature biomass over all years
- Sum of these averages to determine a sustainable average harvest rate
- Ignores
  - *variability in time*
  - *variability in population status*
- Example:
  - *Average HR (15%) + Average change in B (-2%) = 13% sustainable HR estimate*

3: Low risk – average increasing years

- Same mathematical approach as 2
  - Only years which have positive change in mature biomass
- High probability of seeing an increase in population
- Very conservative



area	Average HR	Average mature change	HIGH	NEUTRAL	LOW
juneau	14.66	2.73	17.39	17.22	7.67



area	Average HR	Average mature change	HIGH	NEUTRAL	LOW
pybus	6.06	12.21	18.27	11.51	2.26

Summary

- Neutral:
  - *Equal probability of seeing a decrease or increase in the population*
  - *High probability of being sustainable over time*
- High risk of population decline:
  - *Ignores variability*
  - *Higher risk of over harvesting*
- Low risk of population decline:
  - *High probability of seeing a population increase*
  - *Conservative*
- 2017 fishery – fished at equilibrium level and saw decreases in mature biomass in all of the survey areas fished – even though most were fished under equilibrium
  - CONCLUSION: populations still recovering not at consistent recruitment period

Questions?