

Assessment of East Cook Inlet Razor Clams



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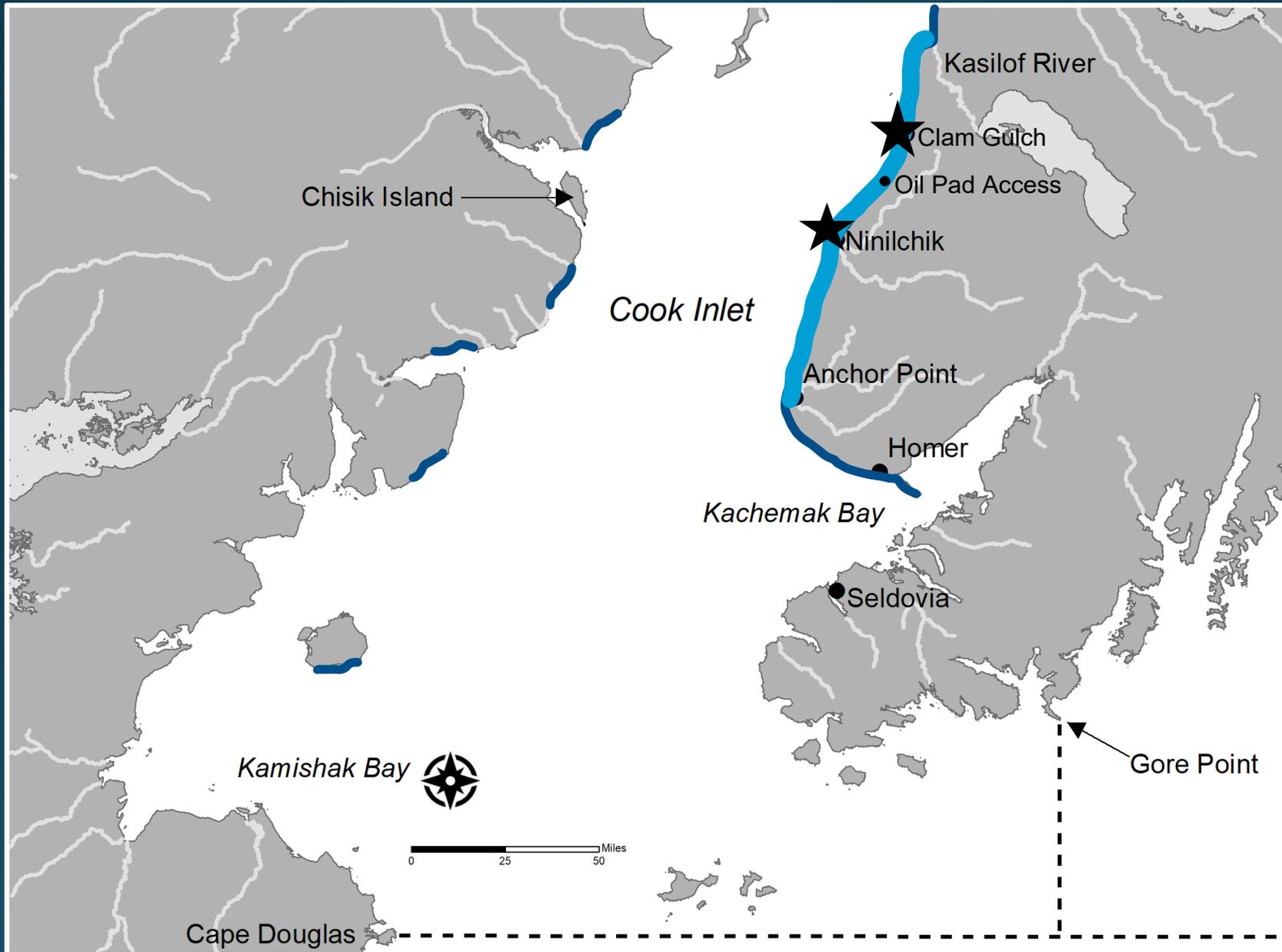
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Overview

- Stock & Fisheries Introduction
- Historical Monitoring
- Stock Decline
- Current Trends & Productivity Indices
- Management Plan Proposal (257)

Cook Inlet Razor Clam Beaches



Cook Inlet Razor Clam Biology



Broadcast spawning occurs in mid-July through early September

Larvae settle onto beaches in 8-10 weeks

Growth occurs only from April through October

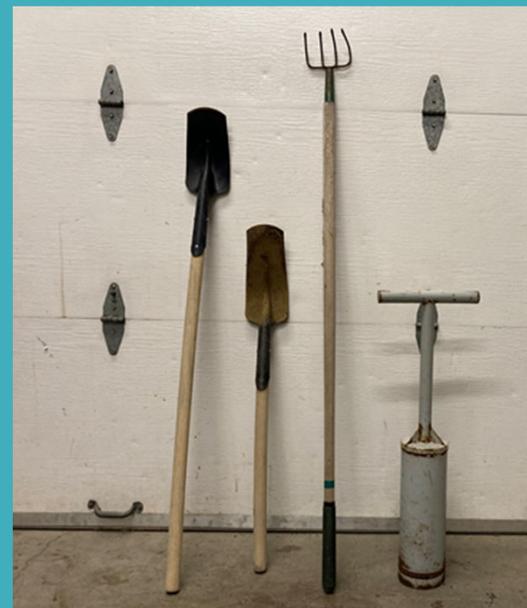
Growth rate decreases in a northly direction

Adult size (80mm; ~3") in 2-3 years at Ninilchik & 4-6 years at Clam Gulch

Maximum size is 180mm (7") & maximum age is 19

East Cook Inlet Razor Clam Fisheries

- Largest noncommercial shellfish fishery in Alaska
- Commercial harvest closed in 1960
- Both Sport and PU but managed concurrently
- Occurs only on minus tides
- Diggers locate clams by finding shows
- Currently managed through gear & limit regulations:
 - Gear is limited to hand, shovels, rakes & clam guns
 - Bag & Possession Limits of first 60/120 clams
- Closed annually by EO since 2015



Historical Monitoring

Fishery Harvest & Effort

- Creel surveys — 60's-70's
- Aerial surveys — since 1970
- SWHS — since 1977

Biological Data

Since early 1960's

- Age & length compositions
- Growth

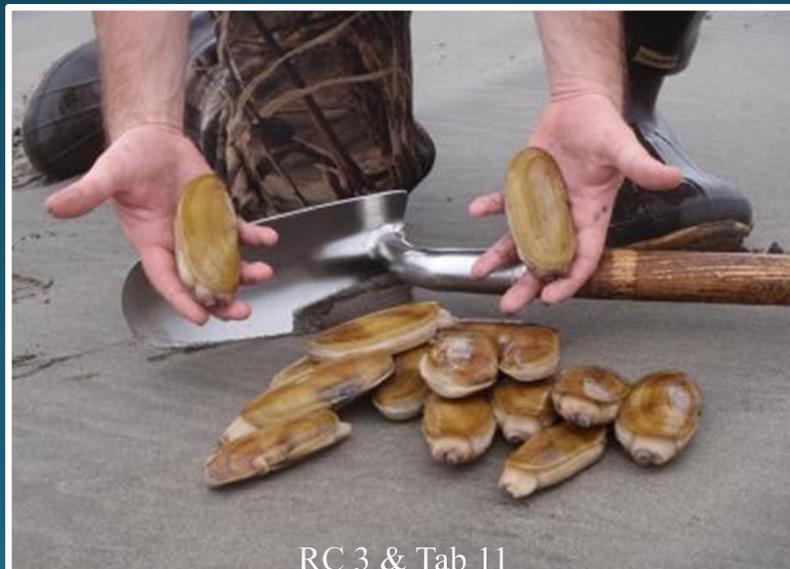
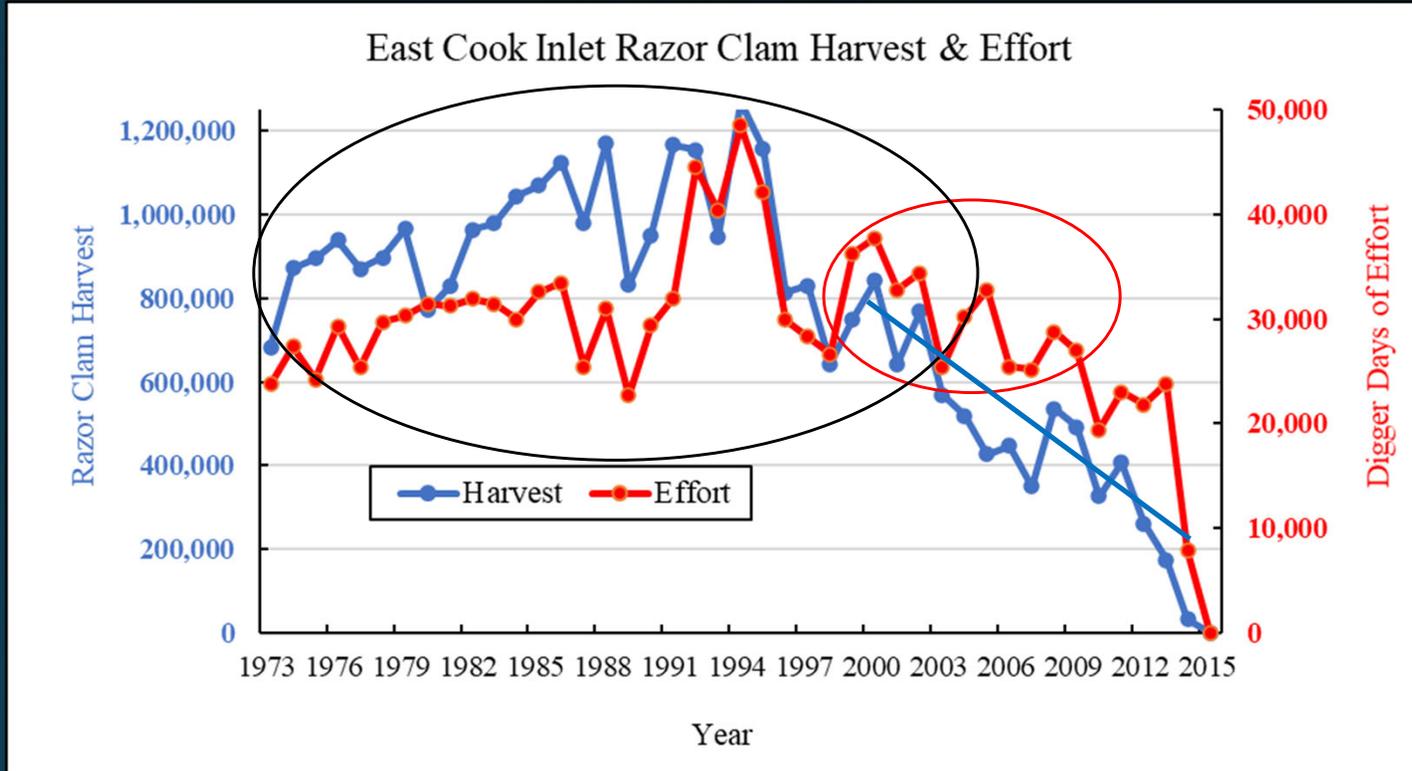
Abundance Surveys

Starting in late 80's

- Periodic abundances
- Harvest rates by area



The Decline: Fishery Data



RC 3 & Tab 11



The Decline: Fishery Data

Years	Ninilchik			Oil Pad Access			Clam Gulch		
	Harvest	Effort	CPUE	Harvest	Effort	CPUE	Harvest	Effort	CPUE
1970—2005	323,555	10,492	36	112,587	3,366	36	299,064	10,330	29
2006—2014	249,933	12,929	19	18,524	1,239	14	40,503	3,398	13
% Change	-22.8	23.2	-46.9	-83.5	-63.2	-60.1	-86.5	-67.1	-56.4

Harvest

- Declined on all beaches
- Slight decline at Ninilchik
- Substantial decline at Clam Gulch

Effort

- Shifted between beaches
- Increased at Ninilchik
- Declined at Clam Gulch

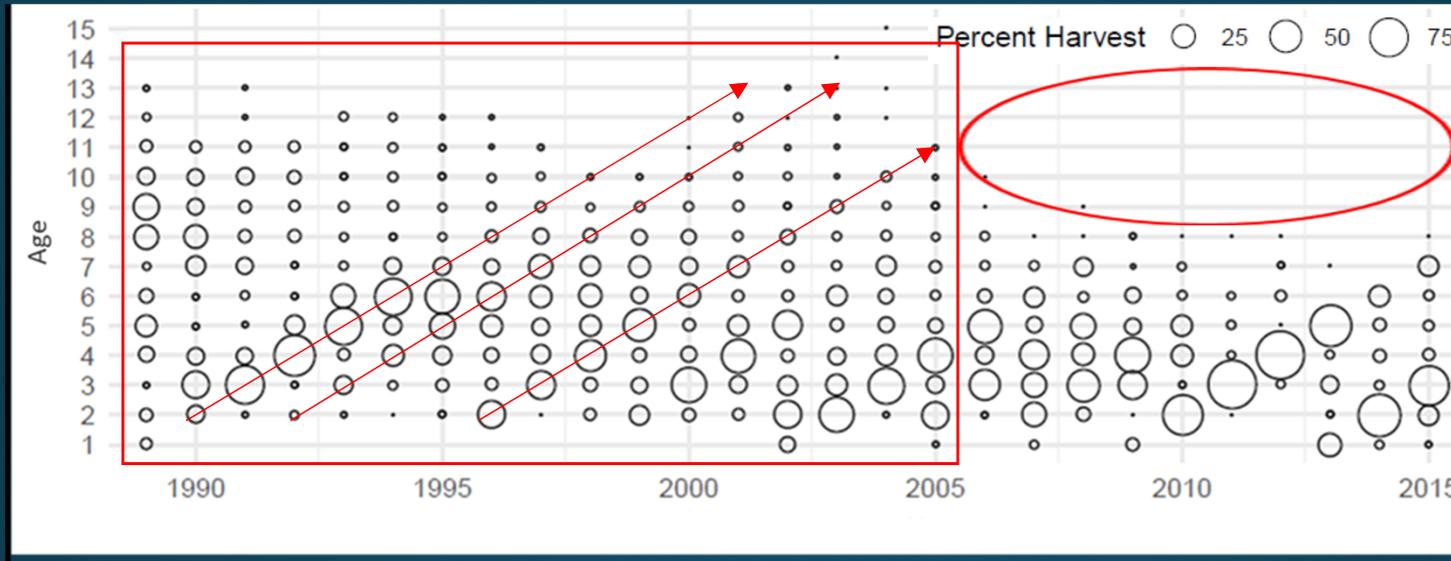


RC 3 & Tab 11



The Decline: Biological Data

Age compositions



Length compositions

Years	Average Total Length (mm)		
	Ninilchik	Oil Pad	Clam Gulch
1970-2005	123	115	113
2006-2014	100	96	91
Percent change	-19%	-17%	-19%

The Decline: Abundance Data

Year	Ninilchik				Clam Gulch			
	South		North		South		North	
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult
1989			6,144,692	1,890,042	922,898	2,336,938	663,528	1,558,920
1990	785,365	198,886	2,513,295	1,026,606	1,382,918	1,131,678	2,210,052	2,040,434
1991	62,025	344,837	320,460	7,989,403				
1992	105,728	294,424	97,258	3,027,221				
1998	199,148	440,267	1,303,124	2,295,866				
1999					990,261	5,913,064	1,017,512	3,696,627
2000								
2001	312,425	270,557	670,108	1,241,228				
2002								
2003	948,415	489,432	3,412,099	1,877,982				
2004								
2005	545,107	505,624	865,989	1,726,587				
2008					925,892	614,581	1,662,479	655,035
2011	220,330	1,928,422	415,472	6,086,149				
2012	53,312	655,336						
2013	5,398	79,548						
2014	172,670	118,055			224,618	147,921	250,186	374,621
2015	47,126	109,157	107,410	234,072	334,446	104,420	333,309	208,798

- Ninilchik abundances in the 2000s were healthy
- 2008 - Clam Gulch adult abundance was lower, but juvenile abundance was sufficient to maintain adult abundance
- Ninilchik 2011 - Adult abundances were sufficient
- EO restrictions starting in 2013



The Decline: Harvest Rates

- Ninilchik harvest rates varied more historically
- Higher harvest rates at Ninilchik
- Clam Gulch harvest rate <10%



Year	Ninilchik		
	Abundance	Harvest	Rate
1990	938,863	263,246	28.0
1991	3,646,088	353,350	9.7
1992	4,295,165	557,424	13.0
1998	1,431,937	277,761	19.4
2001	1,627,777	203,025	12.5
2003	2,407,147	159,392	6.6
2005	2,086,683	175,839	8.4
2011	4,384,112	292,205	6.7

Year	Clam Gulch		
	Abundance	Harvest	Rate
1989	3,966,762	185,571	4.7
1990	3,288,326	280,859	8.5
1999	9,694,299	188,224	1.9
2008	1,268,620	66,241	5.2
2014	519,335	8,331	1.6

What Caused the Decline?

- Fewer clams surviving to older ages/larger sizes – increased natural mortality
- Poor recruitment of juvenile clams - not sufficient to compensate for harvest & natural mortality

Increased mortality from:

- Winter storms/heavy surf
- Predation
- Disease
- Changes to habitat

Poor recruitment from:

- Poor spawning success
- Heavy surf
- Changes to habitat



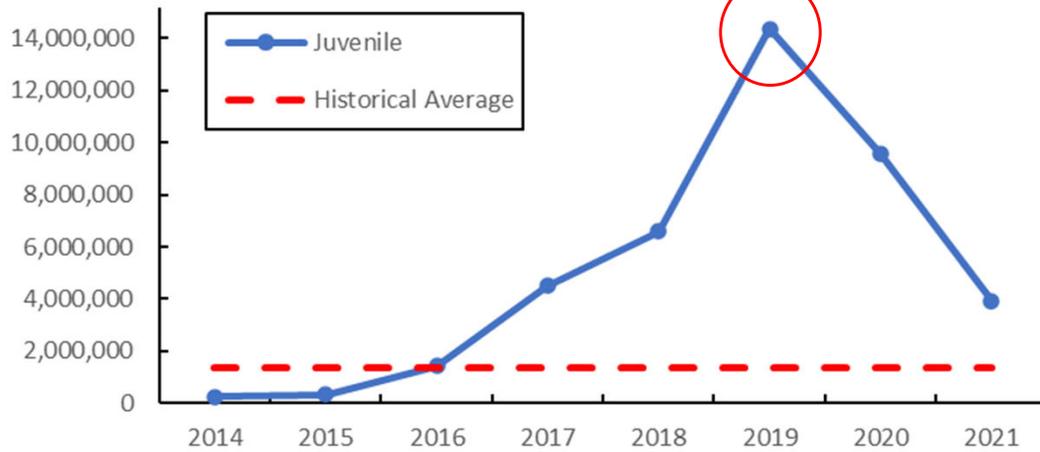
Refining Monitoring & Improved Stock Assessment

- Annual abundance surveys
 - Both Ninilchik & Clam Gulch
 - Increased sampling
 - Maximized efficiency
 - Habitat assessment
- Additional efforts
 - Gene expression - NPS & USGS
 - Genetic connectivity - APU, NOAA & ADF&G
 - Growth & diet- APU
 - Microplastics - APU & Portland State University
 - Disease - State of Washington

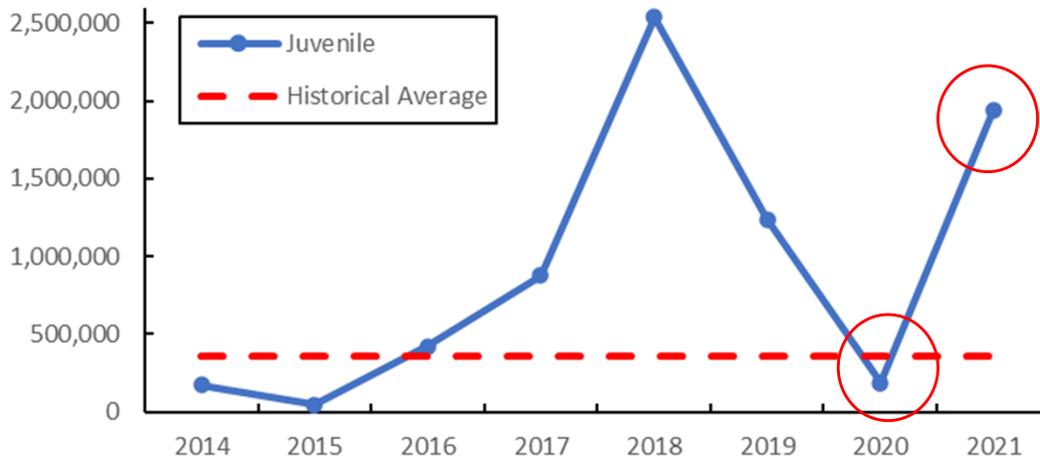


Current Trends: Juvenile Abundance

Clam Gulch North Juvenile Abundance

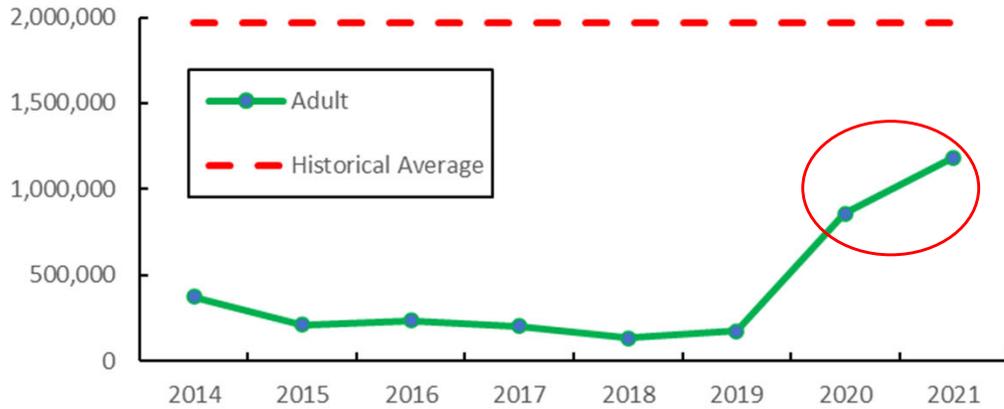


Ninilchik South Juvenile Abundance

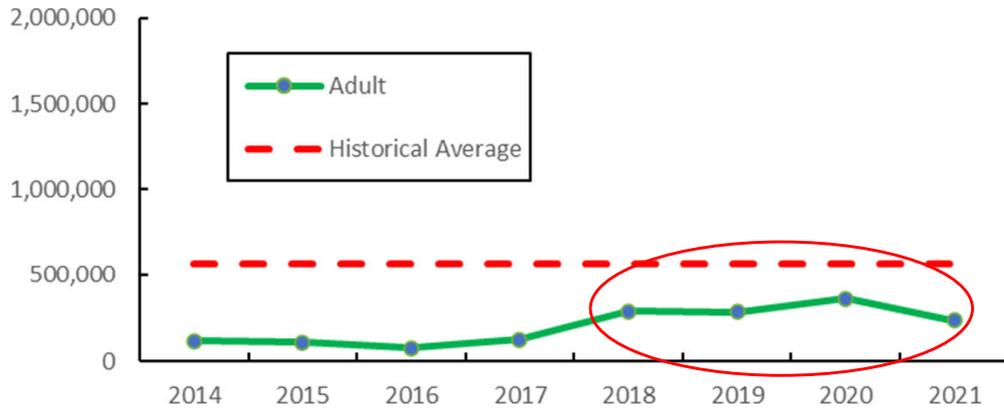


Current Trends: Adult Abundance

Clam Gulch North Adult Abundance



Ninilchik South Adult Abundance



Current Trends: Natural Mortality

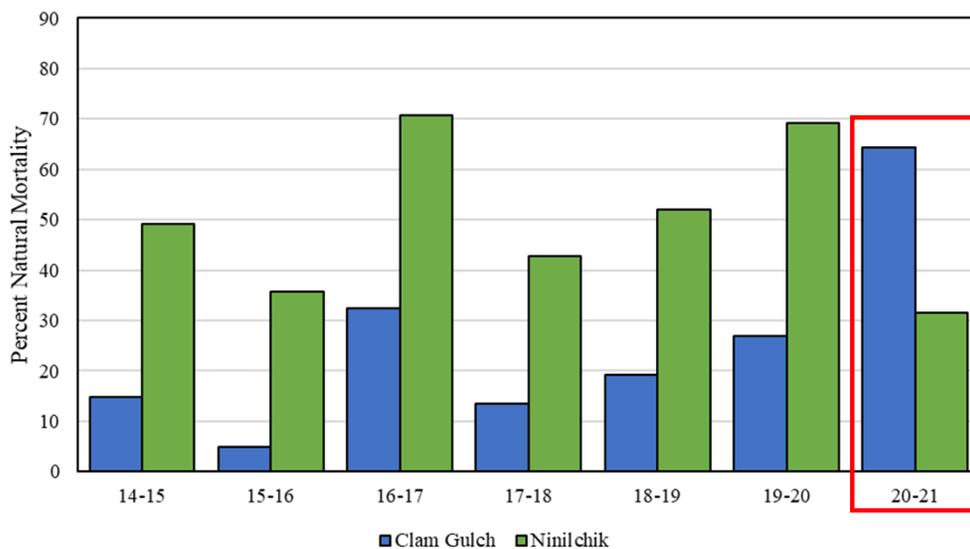
- Juveniles

- Survive better on Ninilchik beaches
- Mortality rate ranges from <10% to >70%
- Mortality averages 25% at Clam Gulch and 50% at Ninilchik

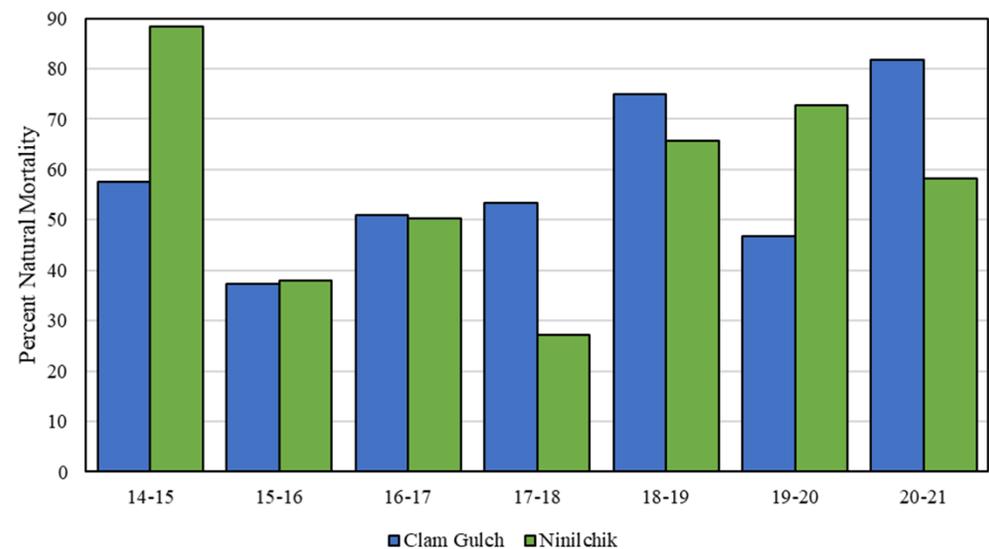
- Adults

- Mortality rate averages 57% at Ninilchik and Clam Gulch
- Both beaches have had rates of >70% since 2018

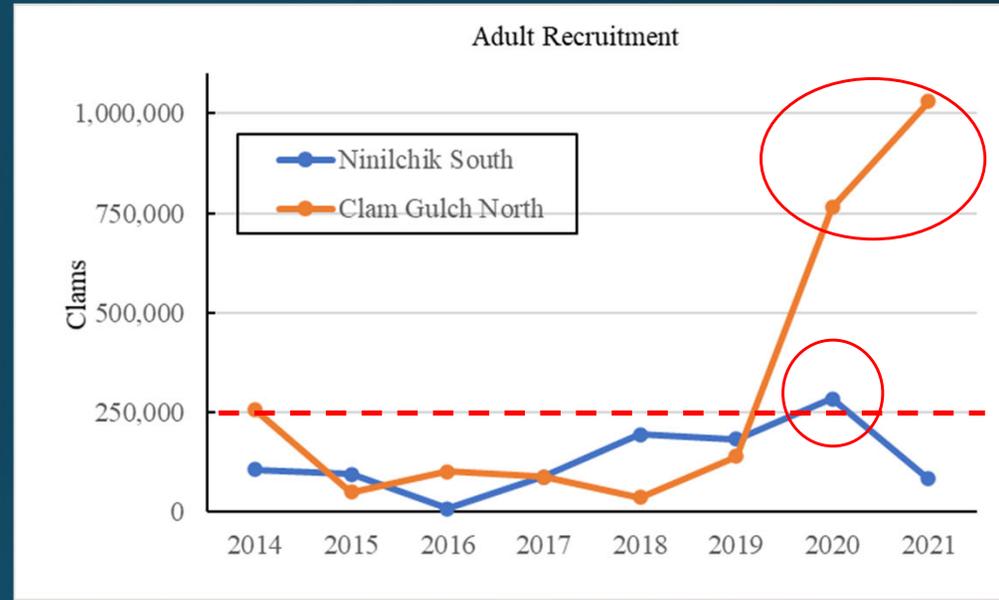
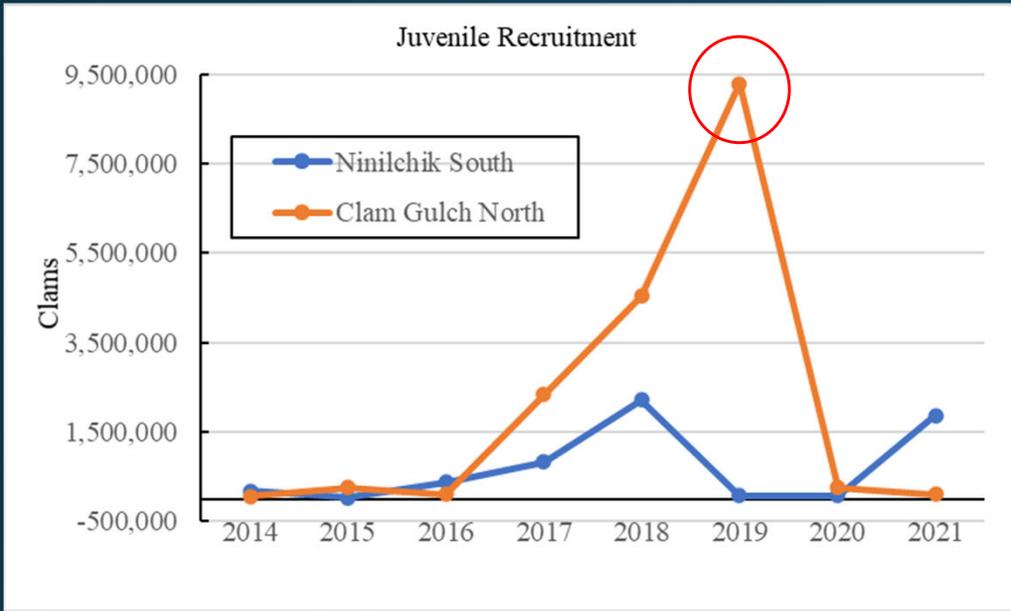
Juvenile Natural Mortality



Adult Natural Mortality

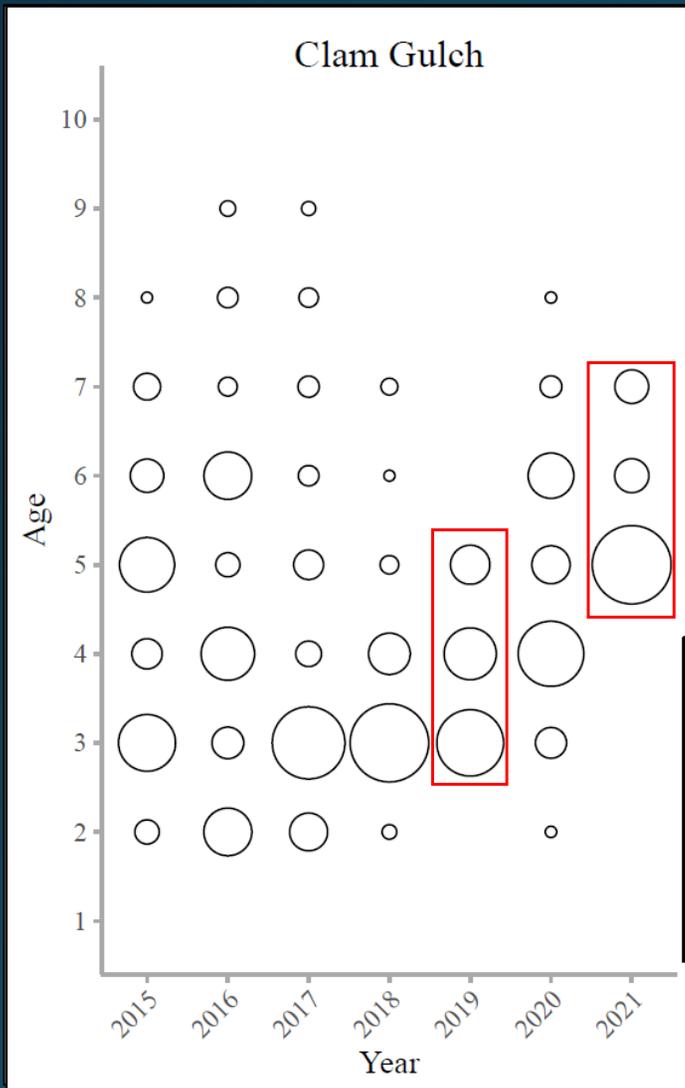


Current Trends: Recruitment



Current Trends: Biological Data

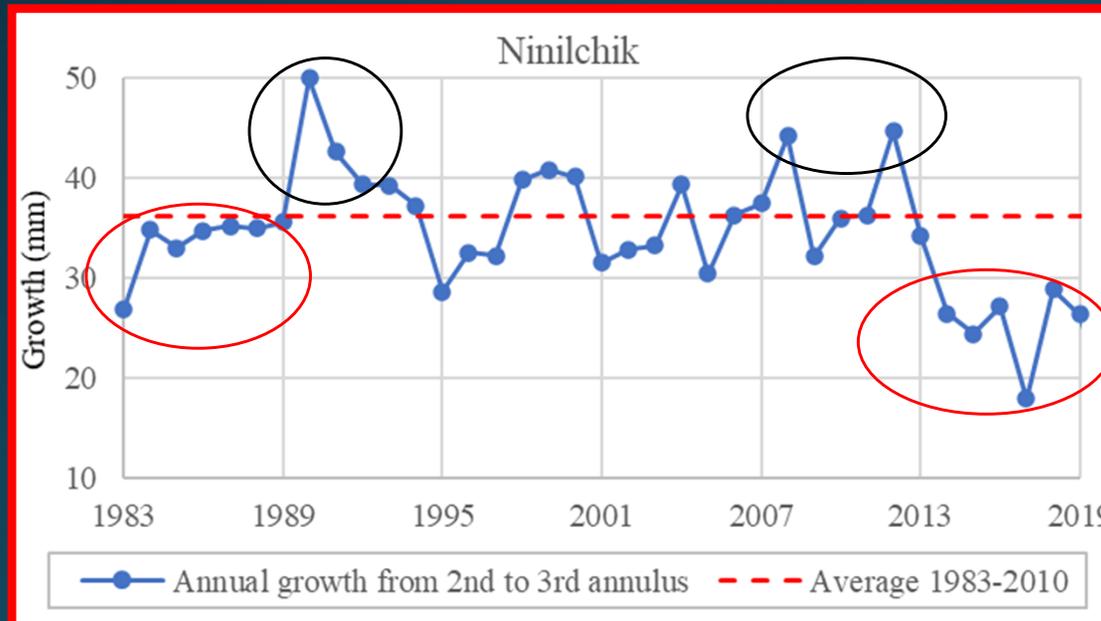
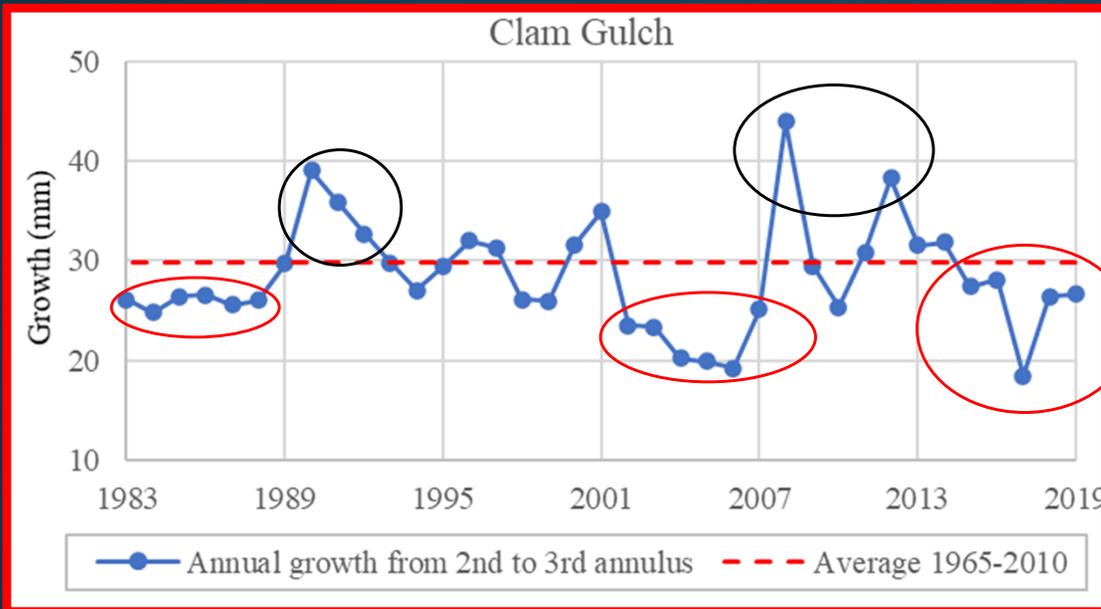
- Average length has continued to decline since the fishery closure
- Age compositions remain truncated across beaches



Period	Years	Average Total Length (mm)		
		Ninilchik	Oil Pad	Clam Gulch
Historical	1970-2005	123	115	113
Fishery decline	2006-2014	100	96	91
Fishery closure	2015-2021	77	71	71
Percent change				
Historical to Fishery closure		-37%	-38%	-37%



Current Trends: Annual Growth



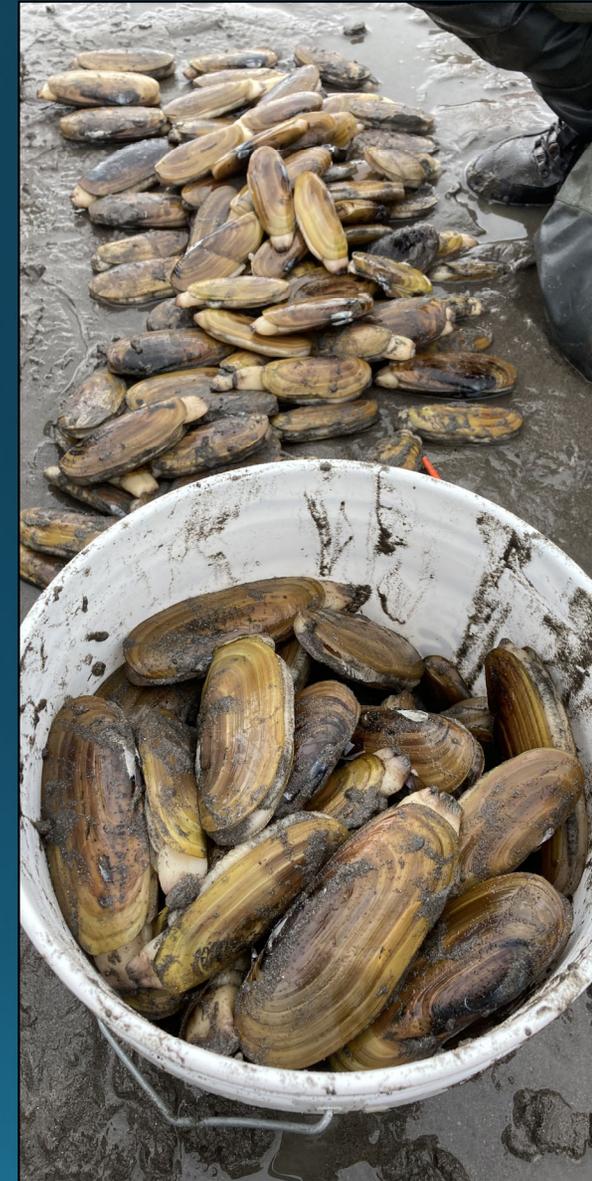
Current Trends: The Report Card

Ninilchik									
Year	Abundance Data						Age and Length Data		
	Juveniles			Adults			Age	Length	Growth
	Abundance	Recruitment	Natural Mortality	Abundance	Recruitment	Natural Mortality			
2015	Red	Red	Red	Red	Red	Red	Yellow	Red	Green
2016	Green	Yellow	Green	Red	Red	Red	Red	Red	Green
2017	Green	Yellow	Red	Red	Red	Red	Red	Red	Red
2018	Green	Green	Yellow	Yellow	Yellow	Green	Yellow	Red	Yellow
2019	Green	Yellow	Red	Yellow	Yellow	Red	Yellow	Red	Yellow
2020	Yellow	Red	Red	Yellow	Green	Red	Green	Red	?
2021	Green	Green	Yellow	Yellow	Red	Red	Yellow	Red	?

Clam Gulch									
Year	Abundance Data						Age and Length Data		
	Juveniles			Adults			Age	Length	Growth
	Abundance	Recruitment	Natural Mortality	Abundance	Recruitment	Natural Mortality			
2015	Red	Red	Green	Red	Red	Red	Red	Yellow	Yellow
2016	Green	Red	Yellow	Red	Red	Yellow	Red	Yellow	Green
2017	Green	Green	Green	Red	Red	Yellow	Red	Red	Red
2018	Green	Green	Yellow	Red	Red	Yellow	Red	Red	Red
2019	Green	Green	Green	Red	Red	Red	Red	Red	Red
2020	Green	Yellow	Green	Yellow	Red	Yellow	Yellow	Red	?
2021	Green	Red	Red	Yellow	Green	Red	Yellow	Yellow	?

Proposal 257

- Management plan for sport and personal use razor clam fisheries in East Cook Inlet
 - Divides East Cook Inlet beaches into two areas
 - Establishes two levels of fishery
 - Limited fishery
 - Historical fishery
 - Recommend thresholds & harvest rates
 - Limited fishery season and bag limit



East Cook Inlet Razor Clam Management Plan Proposal				
	Ninilchik Area		Clam Gulch Area	
	Limited Fishery	Historical Fishery	Limited Fishery	Historical Fishery
Abundance Threshold	50% of Historical Average	Historical Average	50% of Historical Average	Historical Average
Productivity Indices	None	Recruitment & Size Composition	None	Recruitment & Size Composition
Harvest Rate	<10%	<20%	<10%	<20%
Season	May 1-September	Year-round	May 1-September	Year-round
Bag & Possession	30	60/120	30	60/120

Questions?

