Update on groundfish stock trends for the Gulf of Alaska

Report of the
Gulf of Alaska Groundfish
Plan Team meeting
Nov 16–20th, 2009

GOA Plan Team Members

James Ianelli (co-chair)	AFSC
Diana Stram (co-chair)	NPFMC
Cleo Brylinsky	ADFG
Henry Cheng	WDF (joint)
Mike Dalton	AFSC
Bob Foy	AFSC
Nancy Friday	NMML
Jeff Fujioka	AFSC
Sarah Gaichas	AFSC
Ken Goldman	ADFG
Steven Hare	IPHC (joint)
Jon Heifetz	AFSC
Sandra Lowe	AFSC
Tom Pearson	AKR
Nick Sagalkin	ADFG
Leslie Slater	USFWS (joint)
Paul Spencer	AFSC

This information is distributed solely for the purpose of pre-dissemination peer review under applicable information quality guidelines. It has not been formally disseminated by the National Marine Fisheries Service and should not be construed to represent any agency determination or policy.

Stock Assessment Section

GOA Summary (SAFE Intro, p. 13)

- La Nina prevailed in winter 2008-09, shifting to El Nino in winter 2009-10. In spring 2009, the eddy kinetic energy in the GOA was estimated to be lower than average, reducing cross shelf transport. Conditions east of the Alaska Peninsula were less stormy with more transport through shallow Aleutian passes. A weak and broad Alaska Current in Southeast Alaska led to shallow mixed layer depths along the continental shelf.
- A new evaluation of GOA bottom trawl survey temperatures-at-depth for 2007 and 2009 indicated a reversed a pattern of surface warming compared to surveys from 1993-2005. In the two recent surveys the surface temperature cooled markedly with a temperature inversion at the 100 m depth contour with cooler water above warmer water at depth. The pattern was observed throughout the GOA on both surveys but not in earlier years.
- Mesozooplankton abundance peaked relatively late and persisted longer than average in 2008, a cold year.
- Southeast Alaska herring are increasing, with 2005 and 2008 estimated to have the highest spawning biomass in 25 years, and some indications of older spawning fish.
- ADFG trawl surveys dominated by flatfish but with a decrease in total biomass in 2007-08, mostly due to a decline in flathead sole and arrowtooth flounder. Mean distributions of rockfish were farther north and east and more contracted in 2007 relative to prior years, suggesting a recent shift.
- The apex predator guild is driven by high biomass of arrowtooth flounder, while the benthic forager guild is driven by an increase in flathead sole, rex sole and skates. In contrast, pelagic foragers recent mean biomass is low, driven by the decline in pollock. GOA shrimp are above long term mean biomass, due to a long term trend which agrees with trawl survey results. SSL non-pups were slightly up in the eastern GOA, flat in the central GOA, and slightly up in the western GOA.
- Guild analysis combining 2009 stock assessments and surveys in an ecosystem model shows high current biomass for apex predators and benthic foragers, and an increasing trend for benthic foragers. Catch of apex predators and benthic foragers shows increasing trends in recent years, with similar increases in exploitation rates for these guilds. Common trends (temperature-influenced catchability?) seen in cod and pollock BTS data.
- GOA total catch remained close to the long term mean in 2008. Bottom trawl effort trended up from its 2005 low, pelagic trawl effort trended down, while longline and pot effort showed no clear recent trends. Discards have increased in the GOA from a low point in 2005, but remain below the long term mean. The number of vessels fishing in Alaska has been declining but stabilized in 2008.

Overview

Biennial cycle— survey year for GOA

10 stocks in Tier 3

(mostly above $B_{40\%}$)

8 in Tier 5,

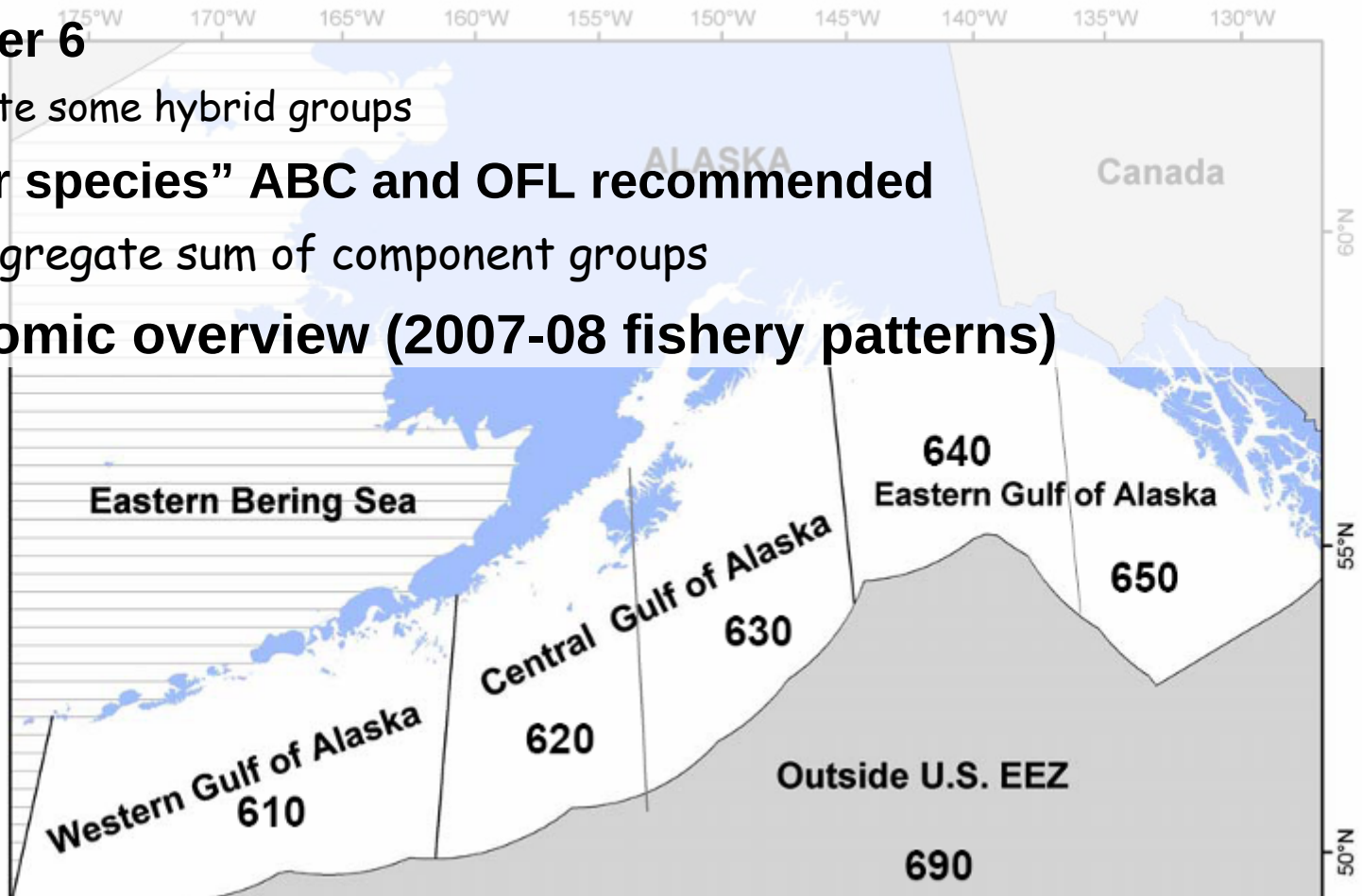
5 in Tier 6

Note some hybrid groups

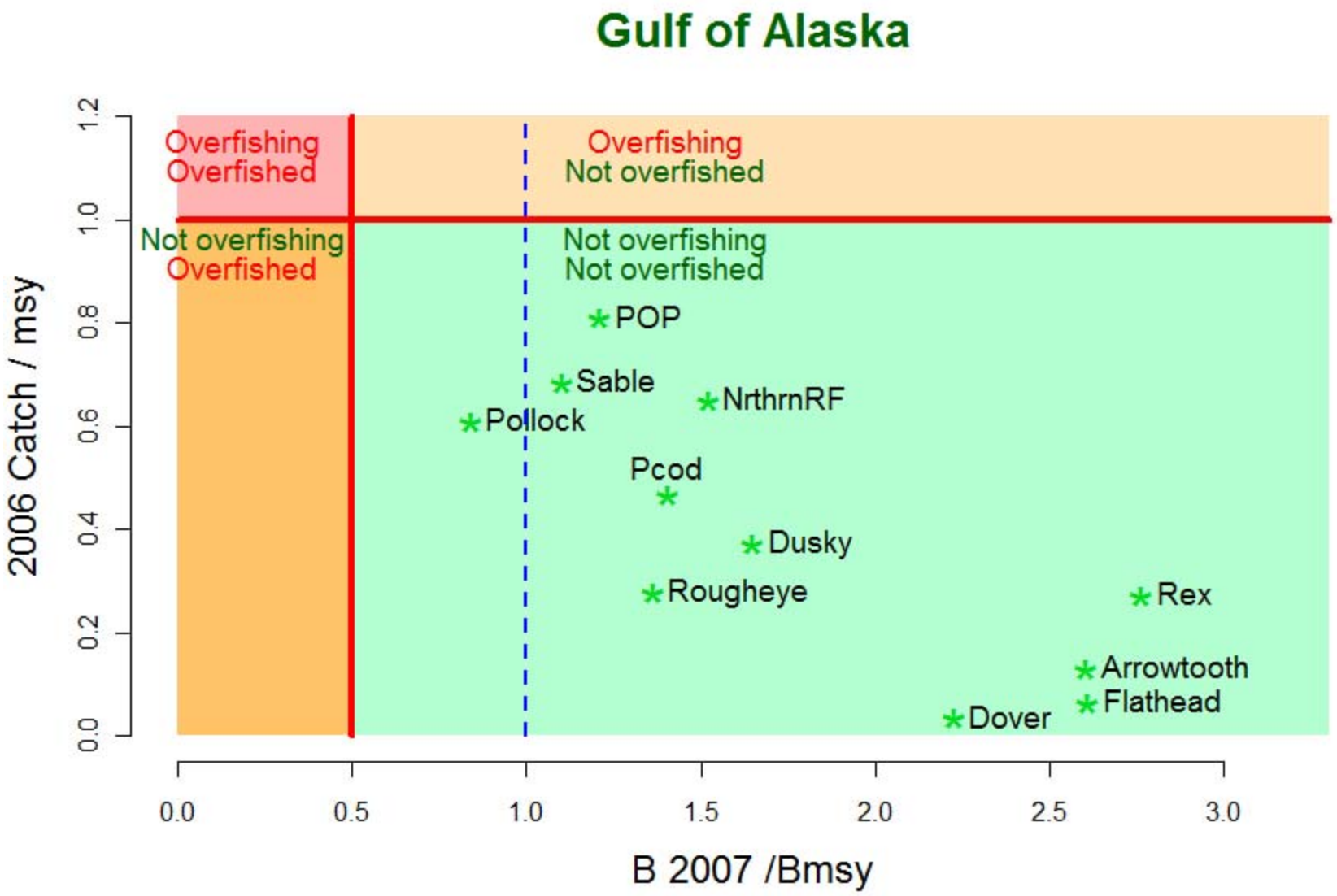
"Other species" ABC and OFL recommended

Aggregate sum of component groups

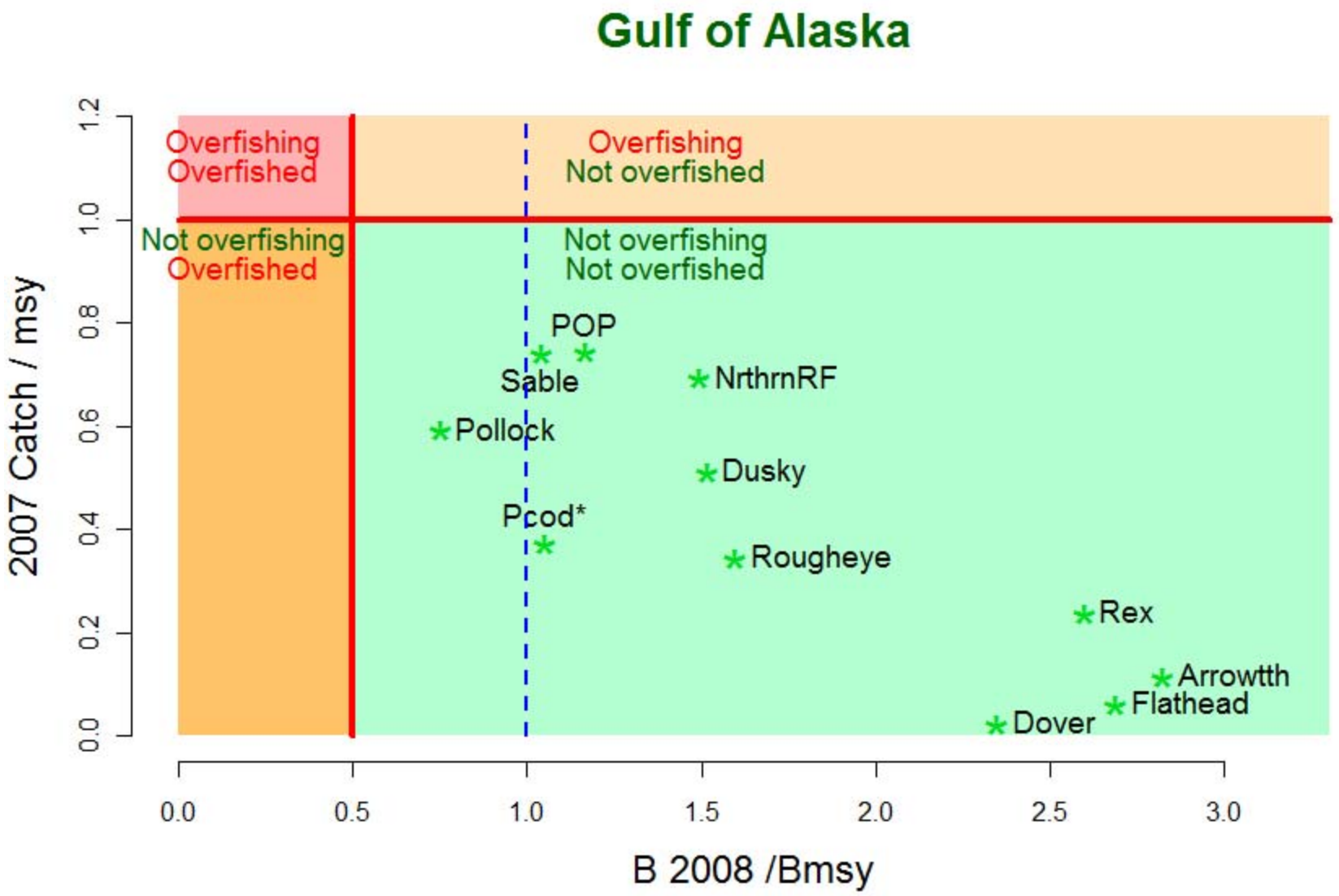
Economic overview (2007-08 fishery patterns)



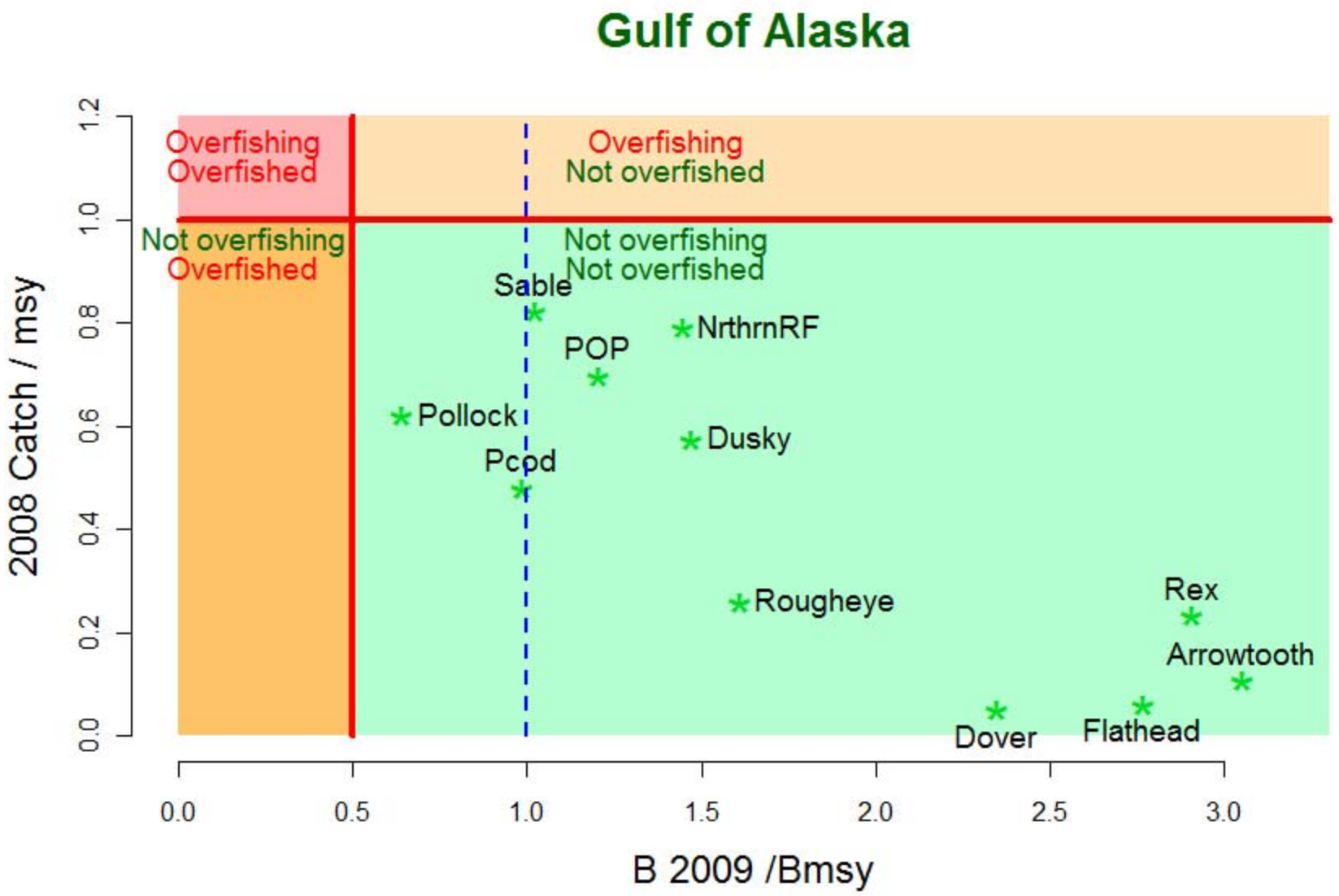
2006


Gulf of Alaska
Overfishing
Overfished
Overfishing
Not overfished
Not overfishing
Overfished
Not overfishing
Not overfished
POP
Sable
NrthrnRF
Pollock
Pcod
Dusky
Rougheye
Rex
Arrowtooth
Flathead
Dover
2006 Catch / msy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
0.5
1.0
1.5
2.0
2.5
3.0
B 2007 /Bmsy

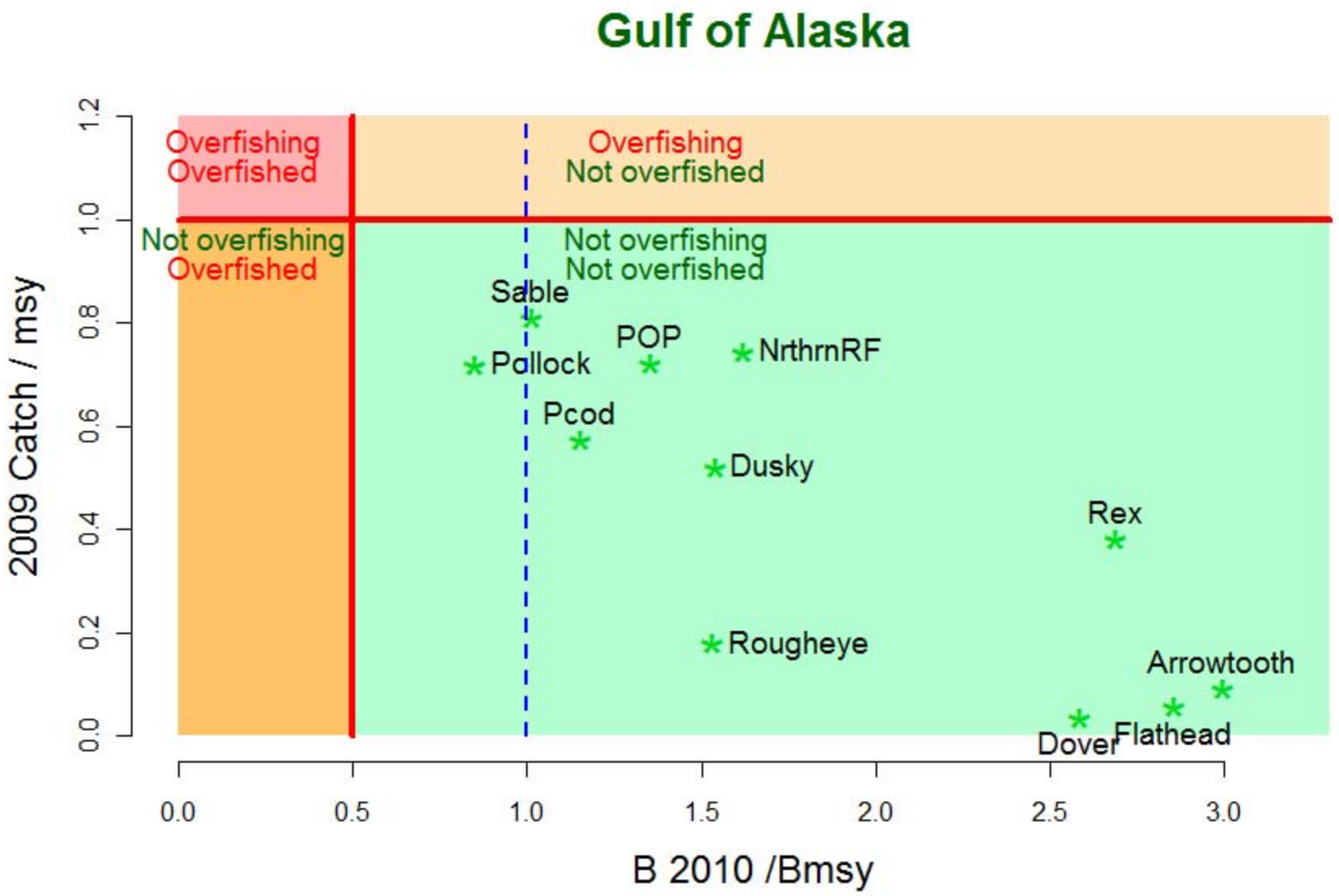
2007


Gulf of Alaska
Overfishing
Overfished
Overfishing
Not overfished
Not overfishing
Overfished
Not overfishing
Not overfished
POP
Sable
NrthrnRF
Pollock
Dusky
Pcod*
Rougheye
Rex
Arrowtth
Flathead
Dover
2007 Catch / msy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
0.5
1.0
1.5
2.0
2.5
3.0
B 2008 /Bmsy

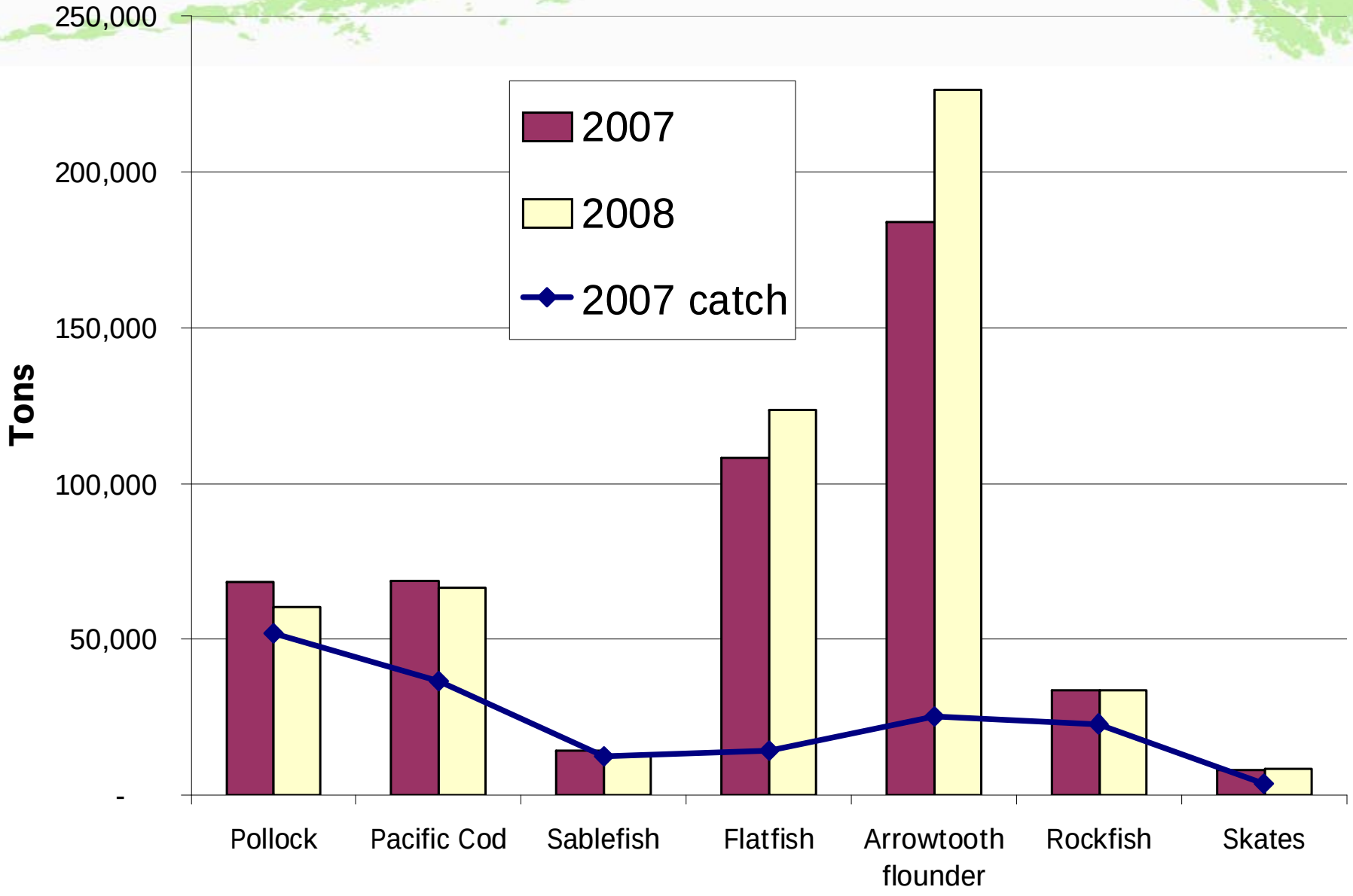
2008


Gulf of Alaska
Overfishing
Overfished
Overfishing
Not overfished
Not overfishing
Overfished
Not overfishing
Not overfished
Sable
NrthrnRF
POP
Pollock
Dusky
Pcod
Rougheye
Rex
Arrowtooth
Dover
Flathead
2008 Catch / msy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
0.5
1.0
1.5
2.0
2.5
3.0
B 2009 /Bmsy

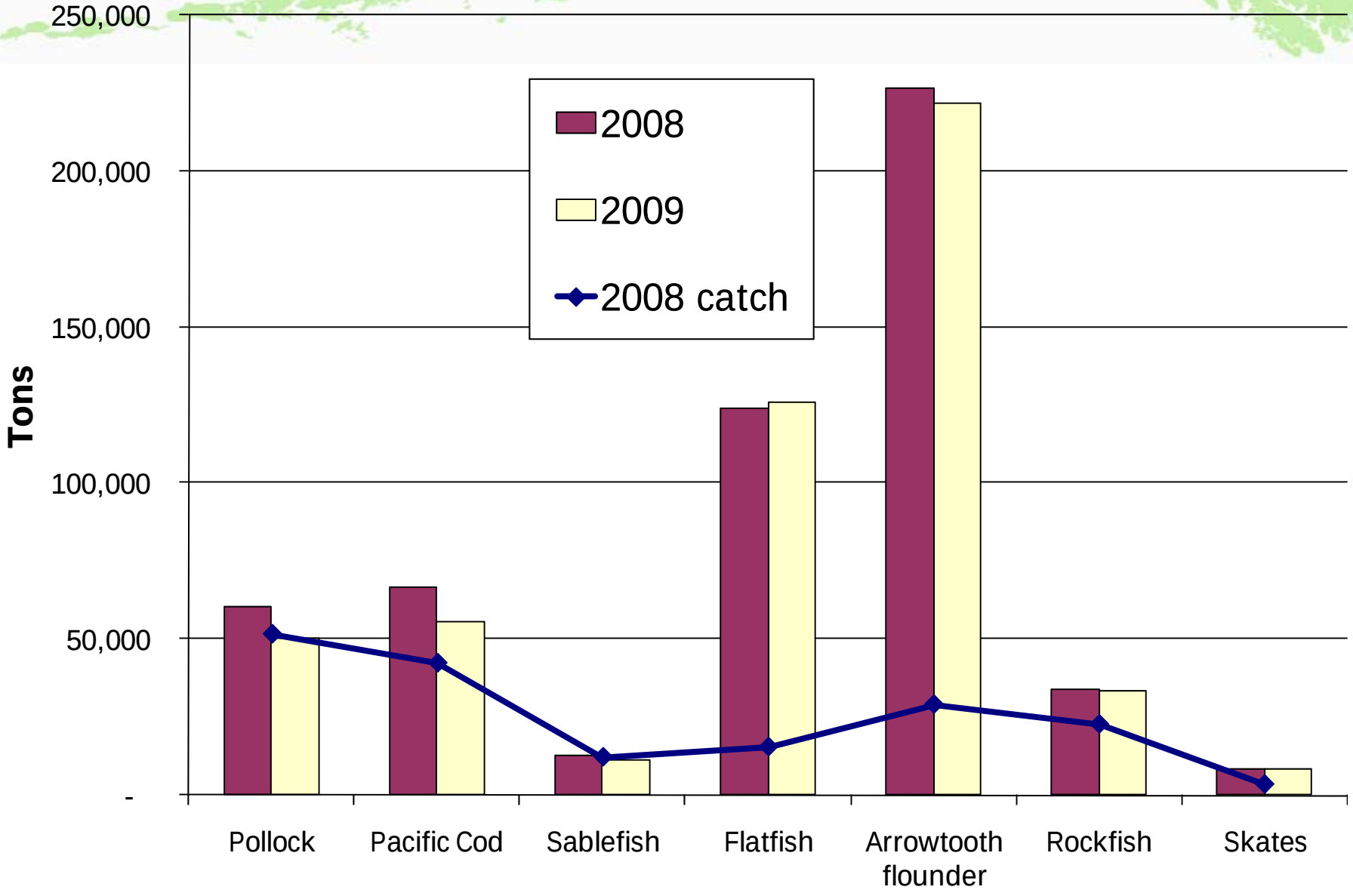
2009


Gulf of Alaska
Overfishing
Overfished
Overfishing
Not overfished
Not overfishing
Overfished
Not overfishing
Not overfished
Sable
POP
NrthrnRF
Pollock
Pcod
Dusky
Rex
Rougheye
Arrowtooth
Flathead
Dover
2009 Catch / msy
B 2010 /Bmsy
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
0.5
1.0
1.5
2.0
2.5
3.0

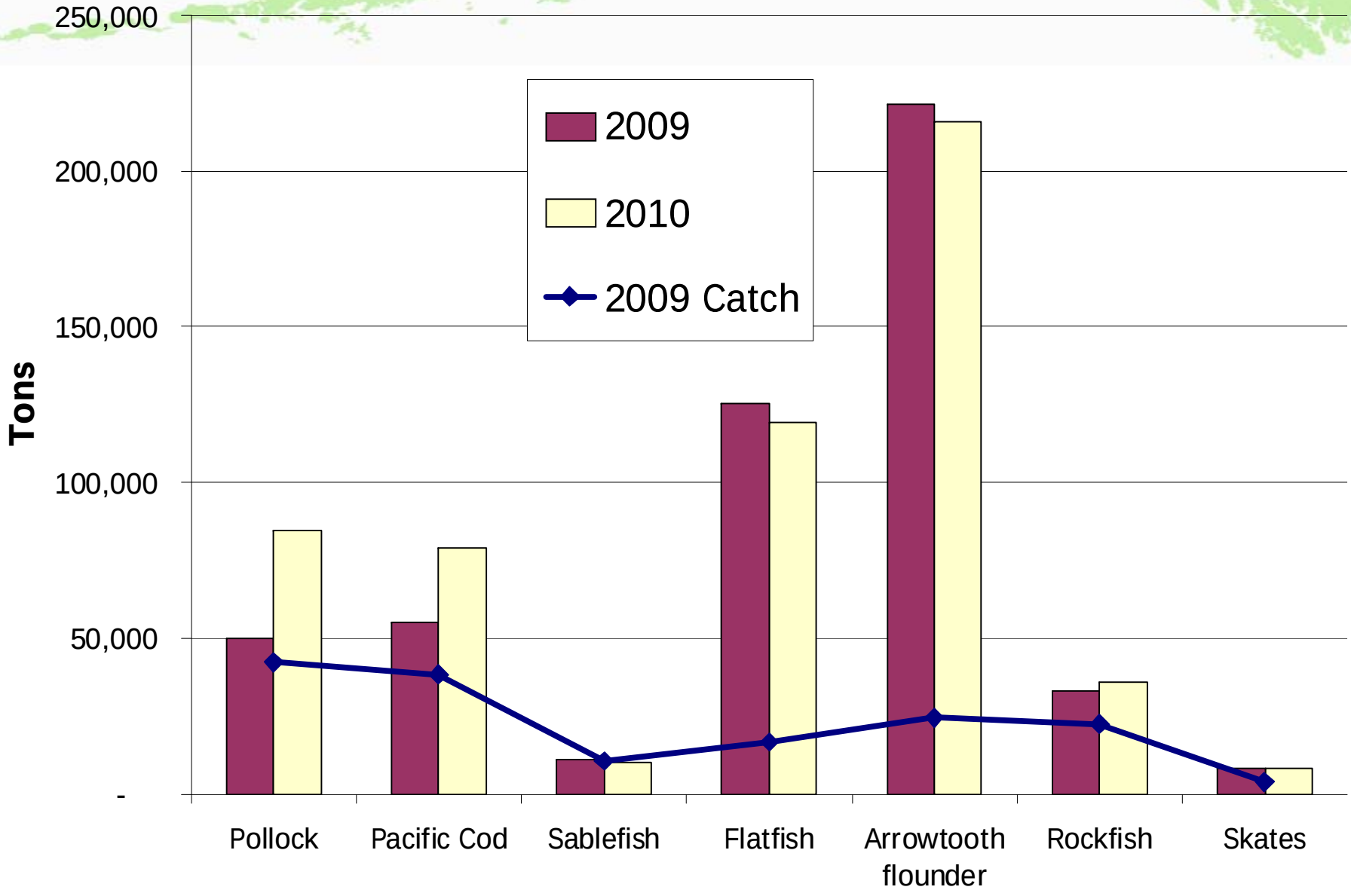
GOA Catch and ABC levels



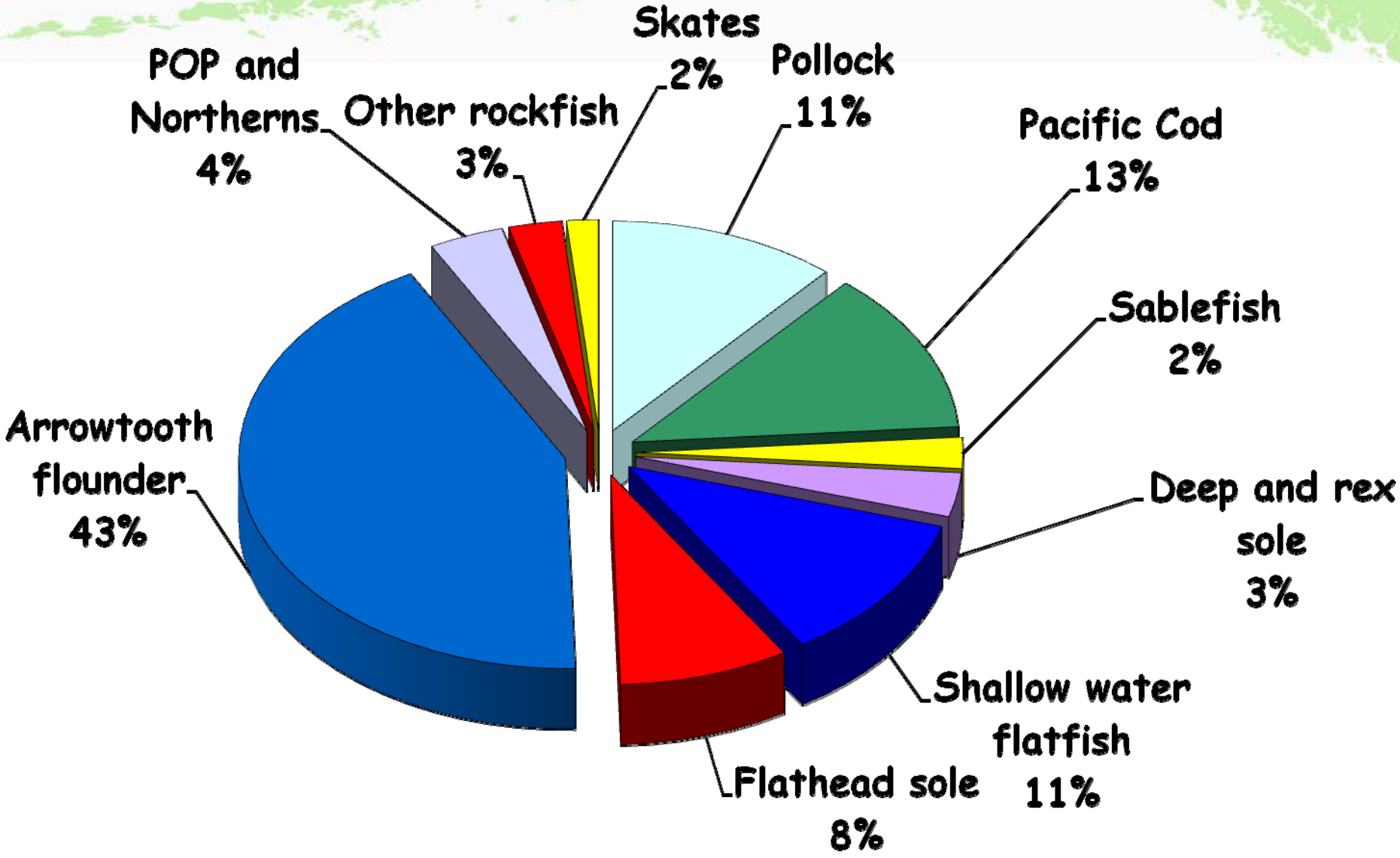
GOA Catch and ABC levels



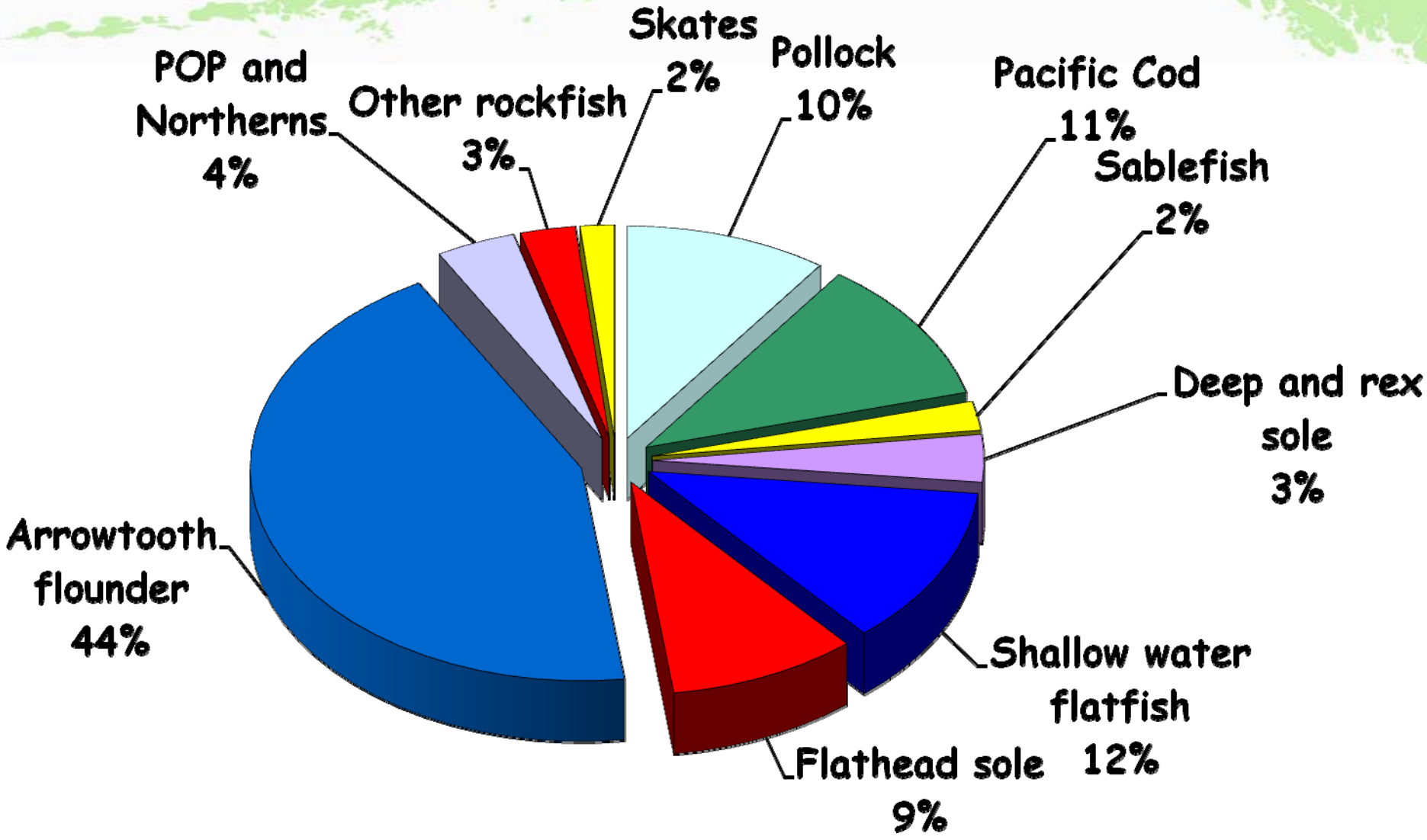
GOA Catch and ABC levels



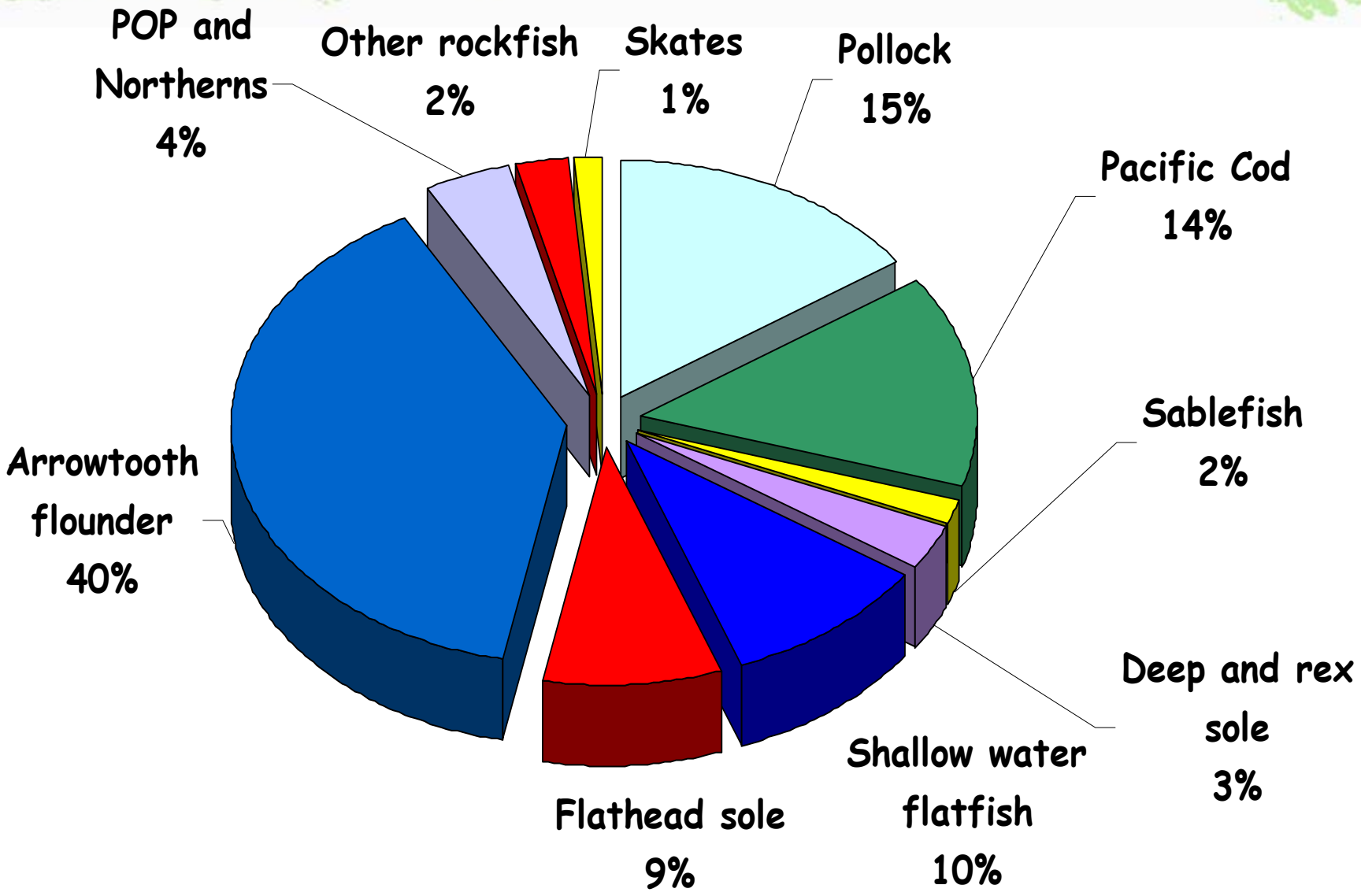
GOA 2008 ABC's: 536,201 t



GOA 2009 ABC's: 516,055 t



GOA 2010 ABC's: 565,501 t



ABC

- **Plan Team recommendations where ABC < maximum permissible:**

	Percent of Max permissible
Pollock	84%
Demersal shelf rockfish	77%

Species overviews

1. **2010 ABC/Catch and recommended changes**
2. **Highlights**
   - New data
   - Analytic approach (changes)
3. **Stock status and trend**
4. **ABC/OFL**
   - Tier history and candidacy
   - 2010, 2011 max*ABC*; recommended *ABC* (if < max)

Most detail on pollock, Pacific cod, and sablefish

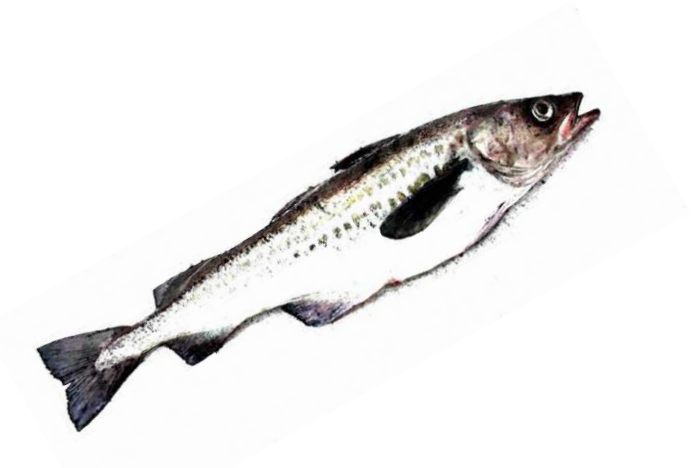
ABC

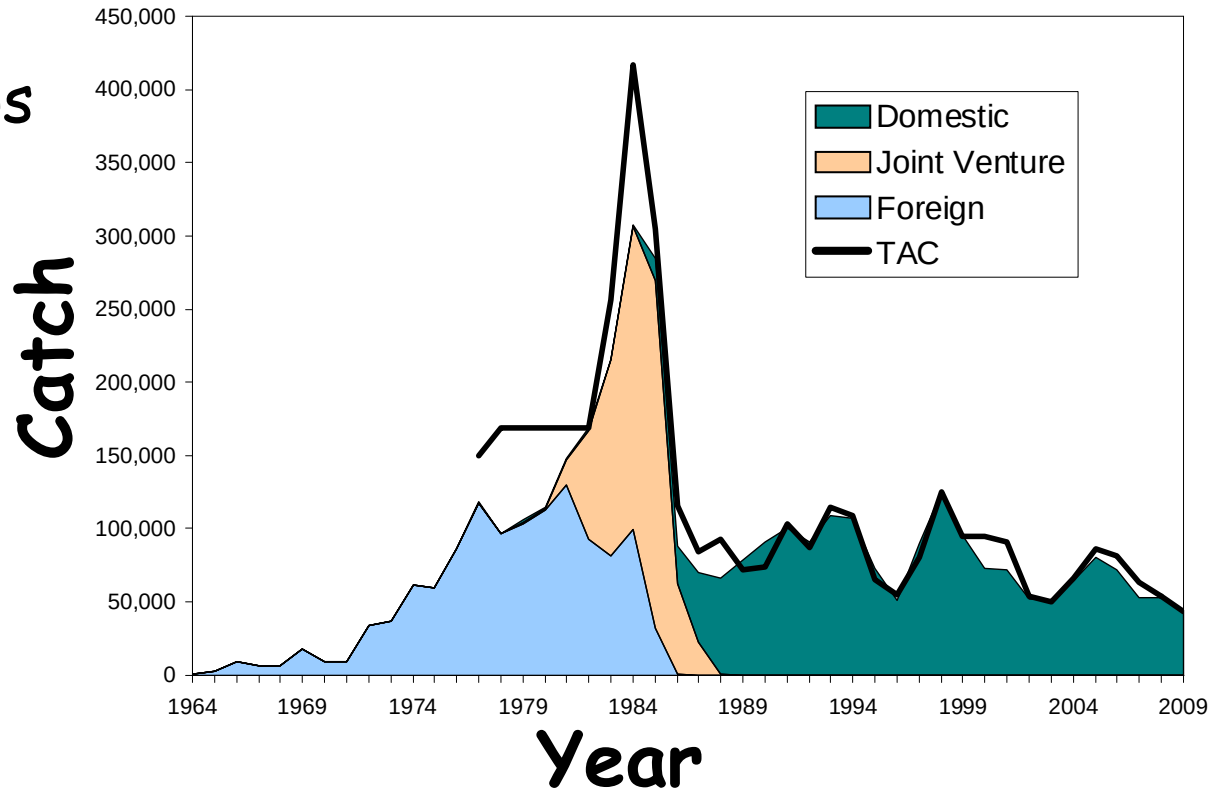
Species	2009 Catch	ABC 2009	ABC 2010	Change	
Pollock	42,297	49,900	84,745	up 34,845	(70%)
Pacific Cod	38,401	55,300	79,100	up 23,800	(43%)
Sablefish	10,698	11,160	10,370	down 790	(7%)
Flatfish	16,657	125,617	119,583	down 6,034	(5%)
Arrowtooth flounder	24,438	221,512	215,882	down 5,630	(3%)
Rockfish	22,408	33,005	35,773	up 2,768	(8%)
Atka mackerel	2,221	4,700	4,700	same	(0%)
Skates	3,935	8,321	8,273	down 48	(1%)
Other Species	2,327	6,540	7,075	up 535	(8%)
Total	163,382	516,055	565,501	up 49,446	(11%)

Summary: Page 15
Chapter: Page 61

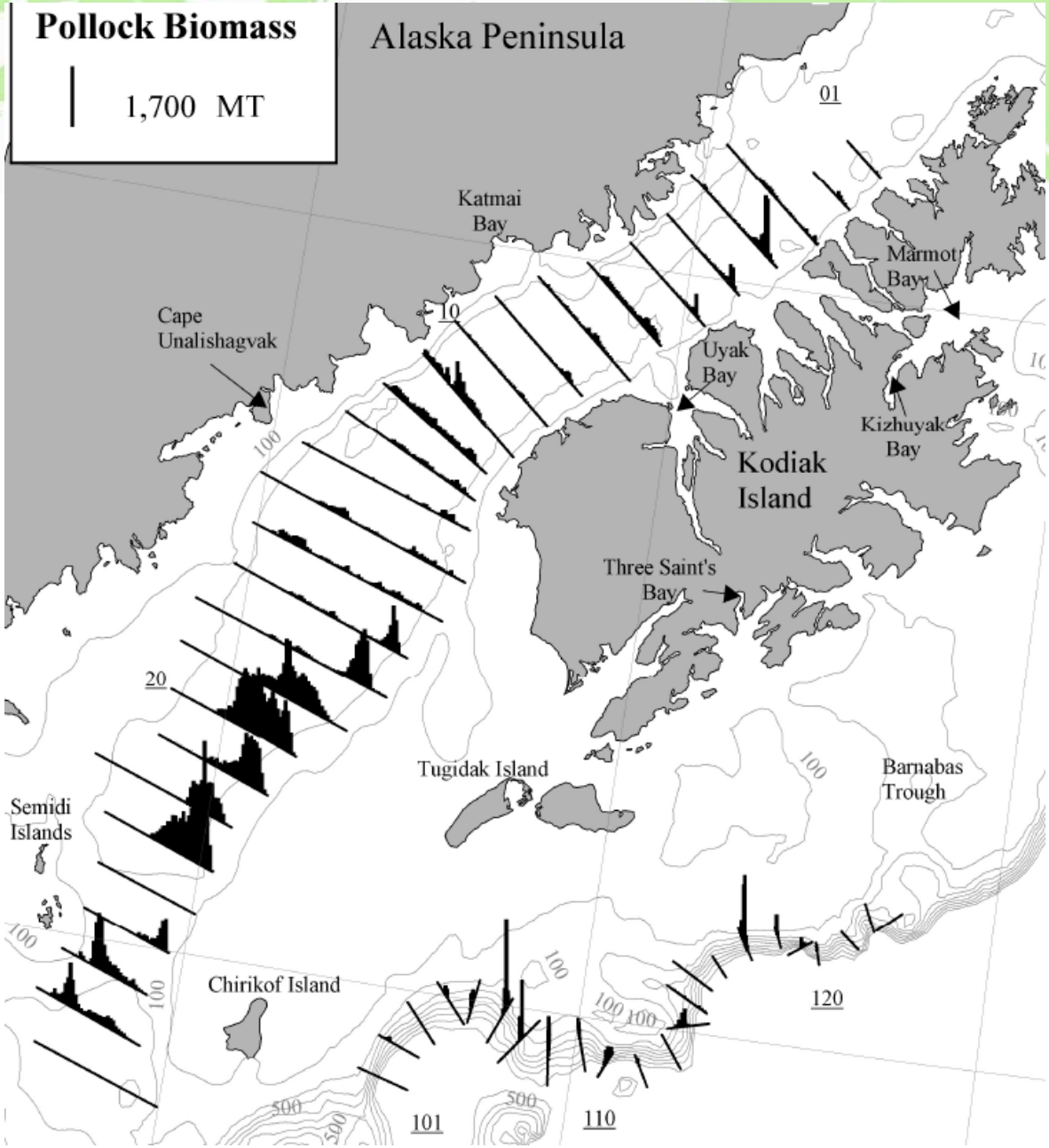
New Data-GOA pollock

- Fishery: 2008 total catch and catch at age
- Shelikof EIT survey: 2009 biomass and age composition
- NMFS summer survey: 2009 biomass
- ADF&G trawl survey:
  - 2009 biomass
  - 2009 length comps
  - 2008 age comps

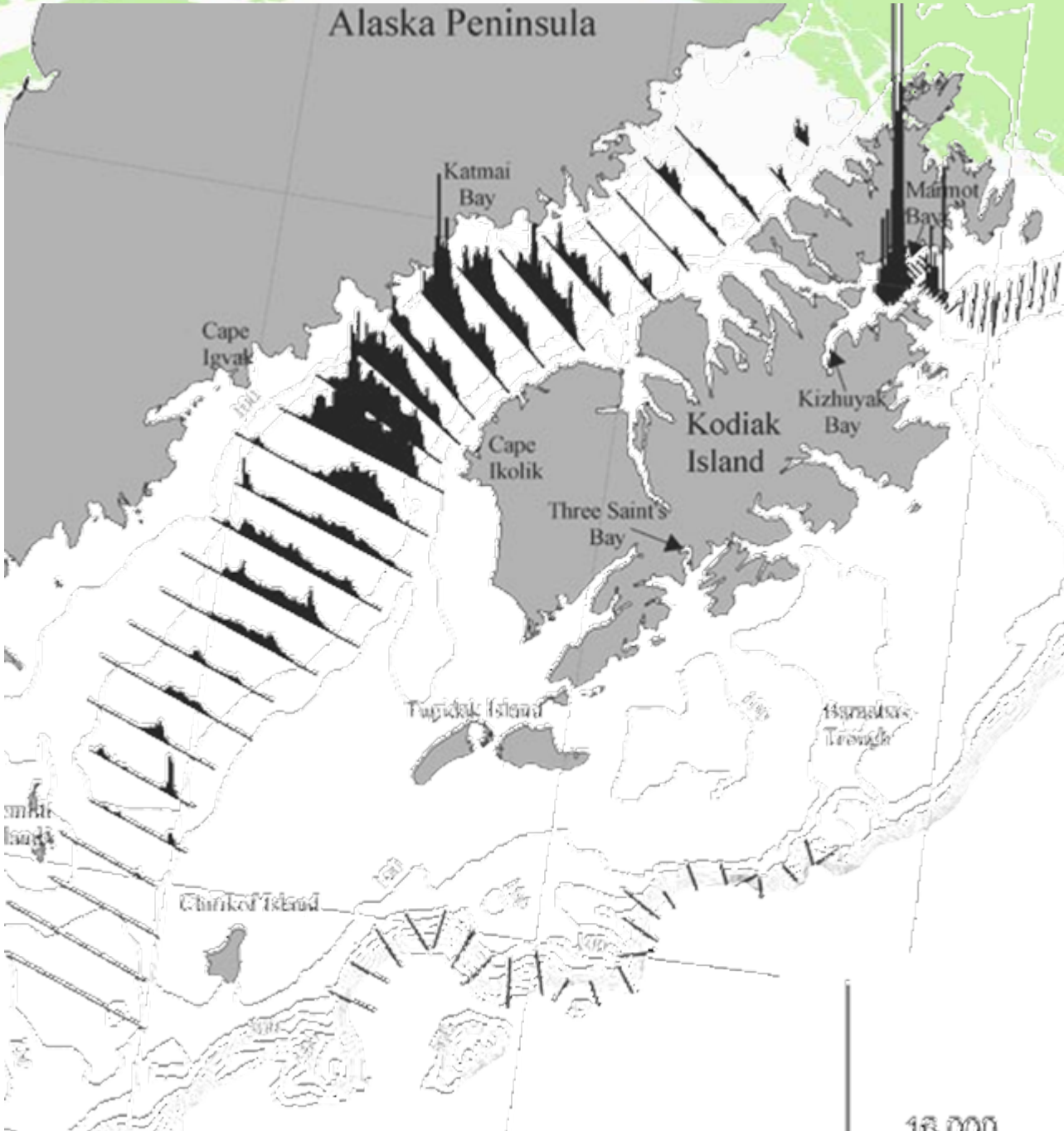




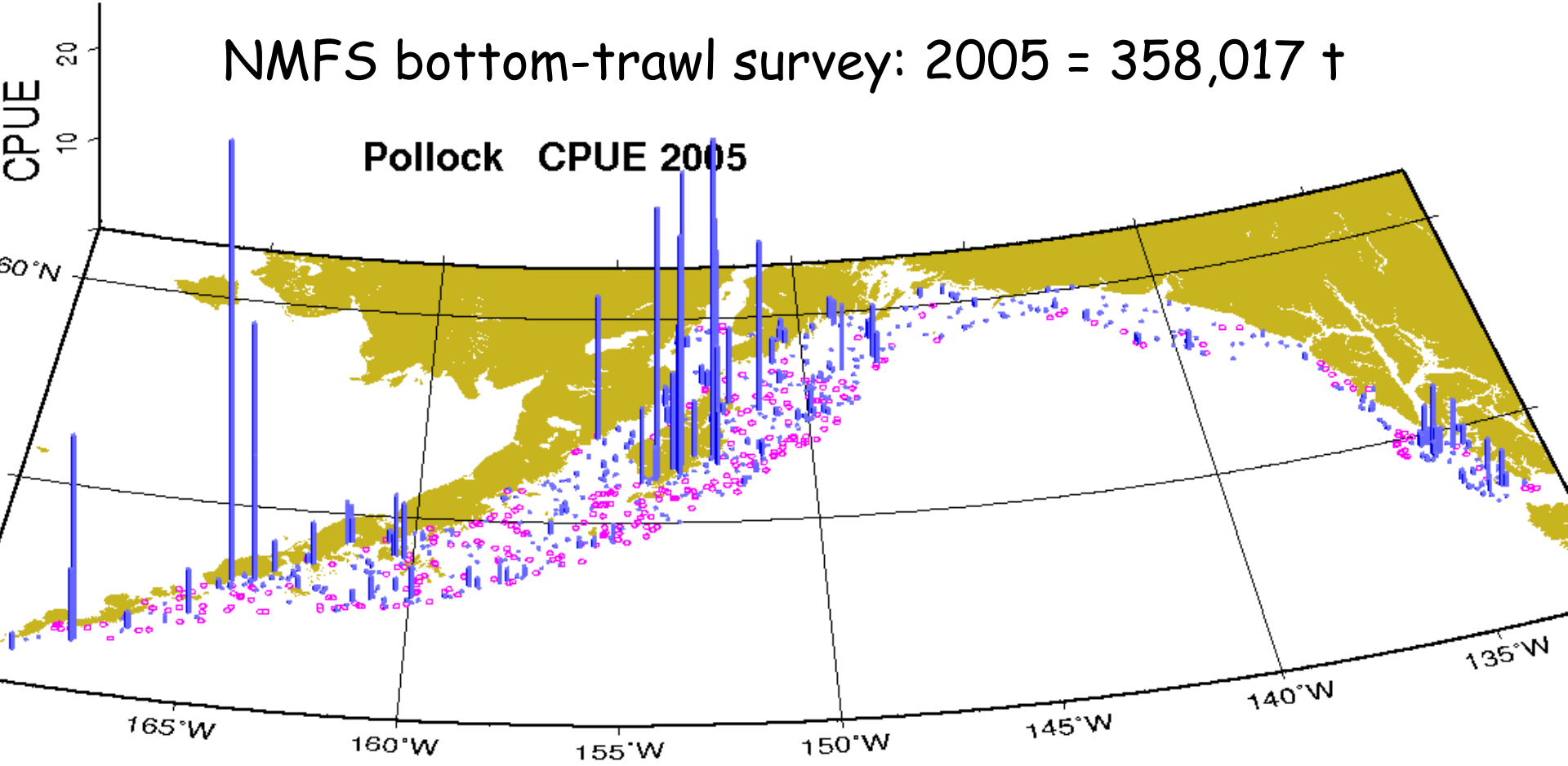
2008 Winter GOA pollock survey



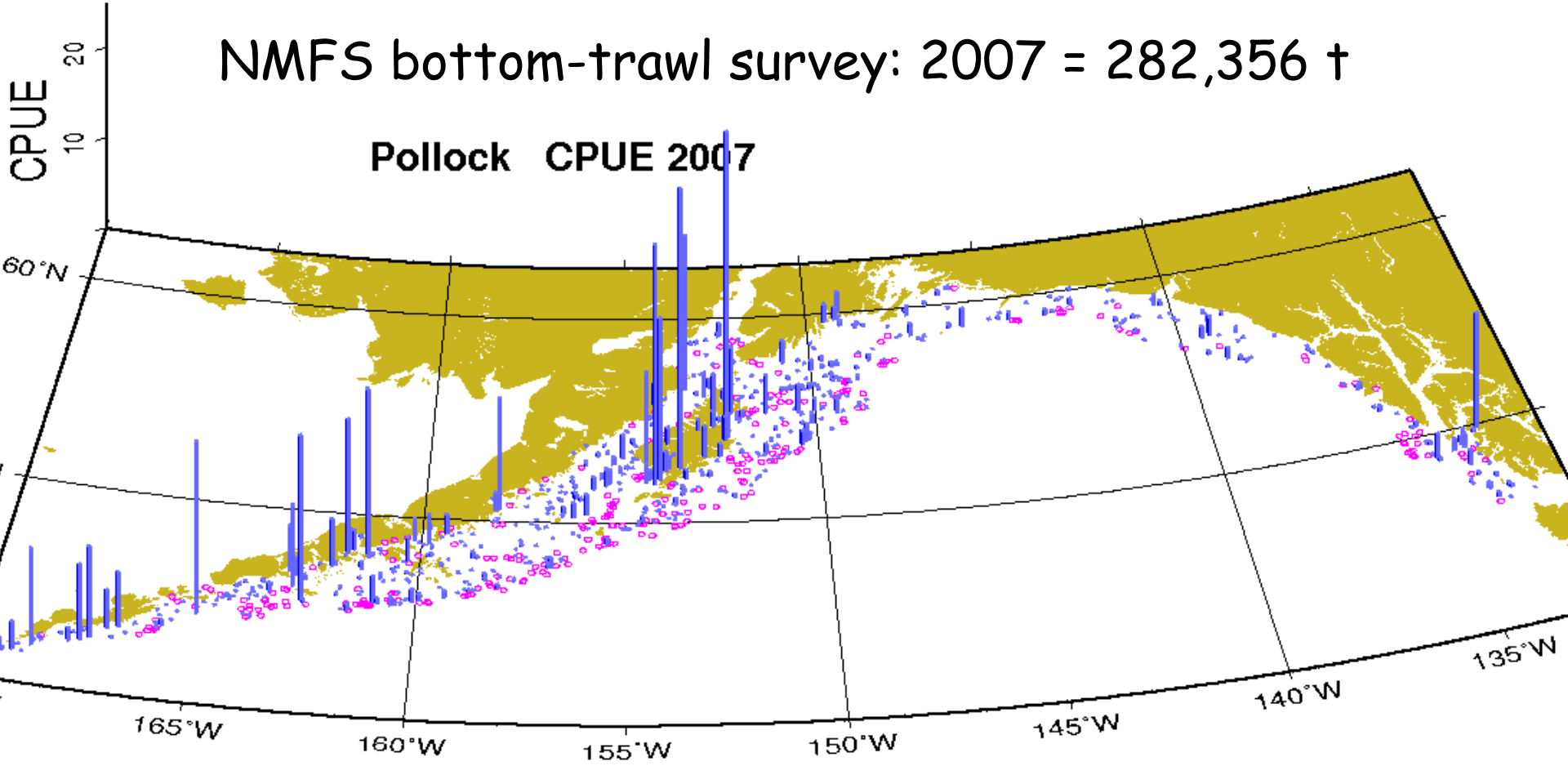
2009 Winter GOA pollock survey



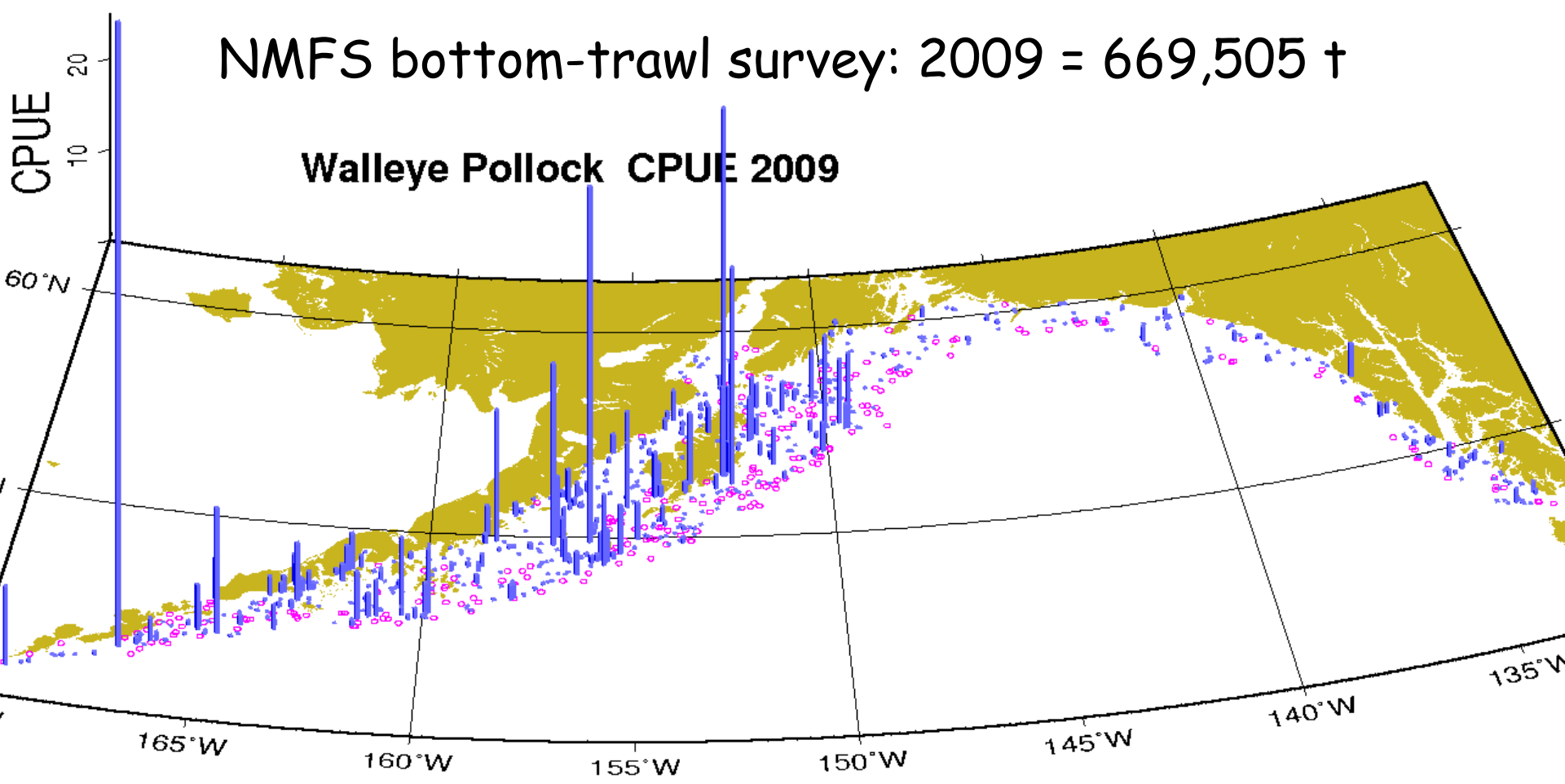
NMFS bottom-trawl survey: 2005 = 358,017 t



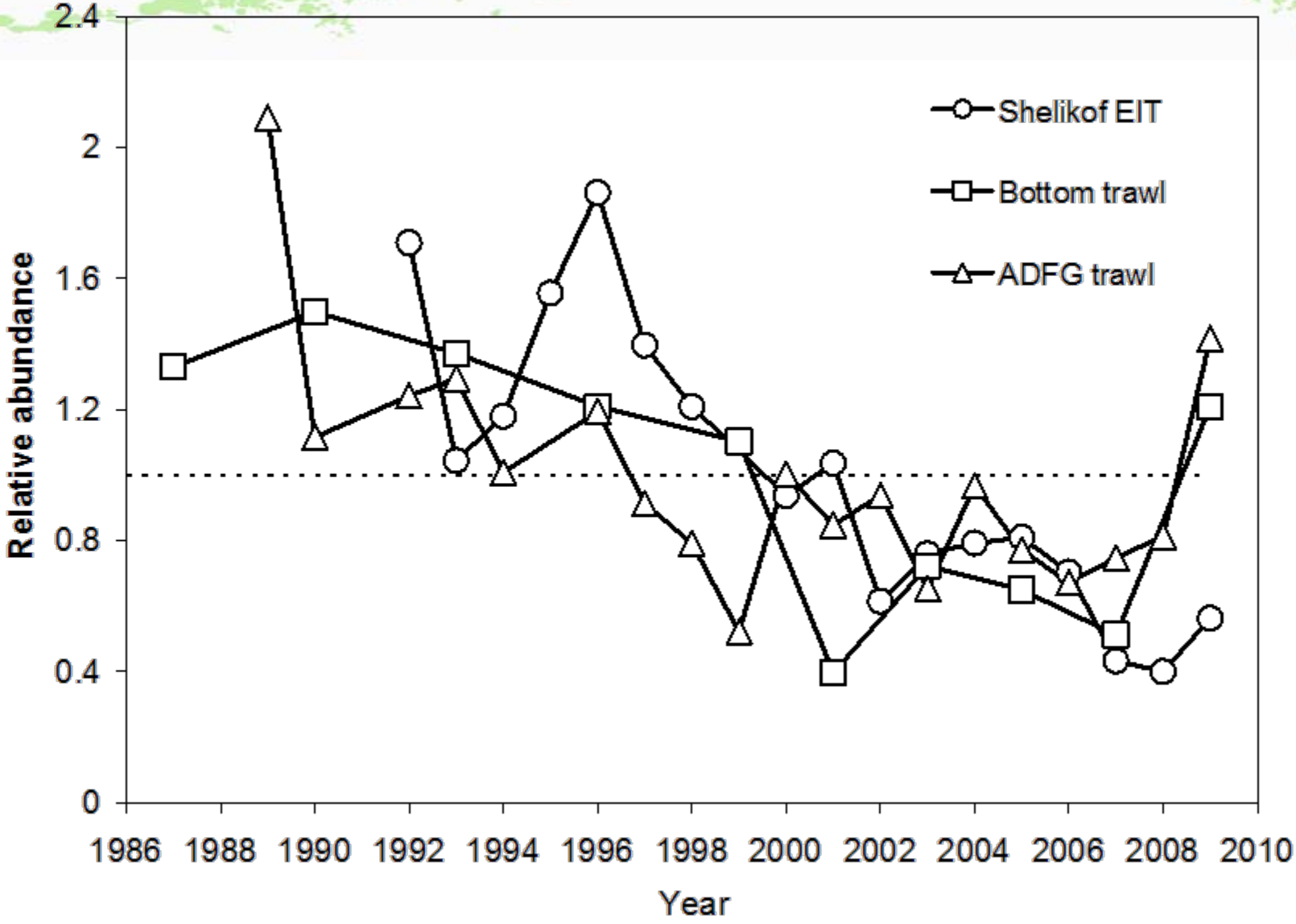
NMFS bottom-trawl survey: 2007 = 282,356 t



NMFS bottom-trawl survey: 2009 = 669,505 t

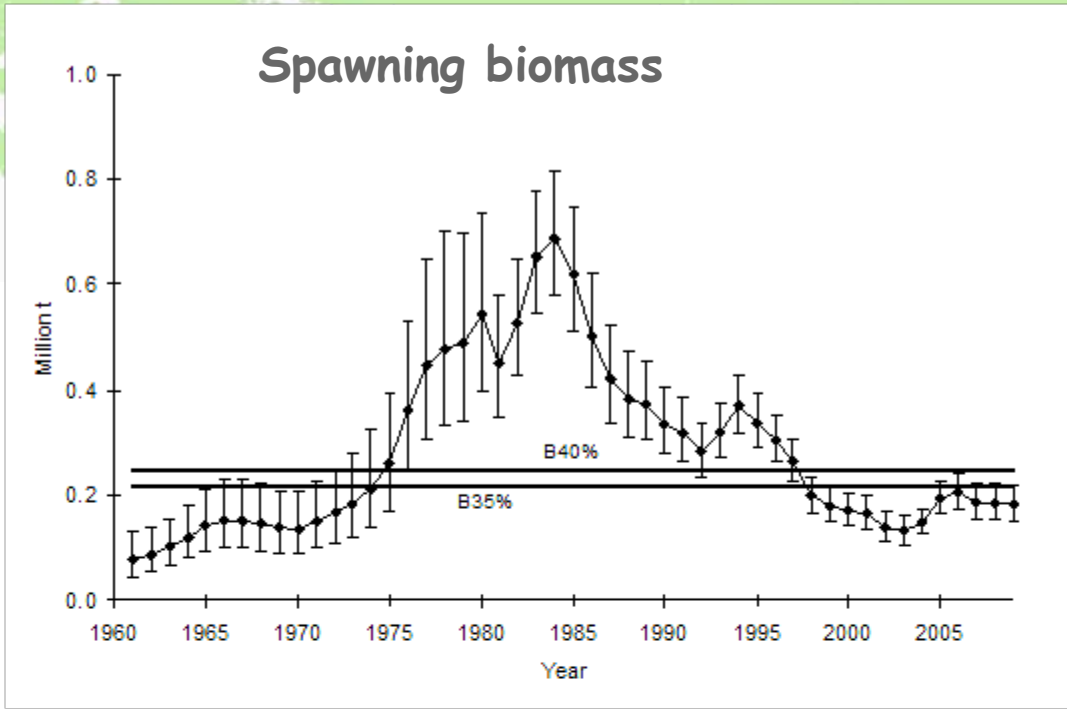


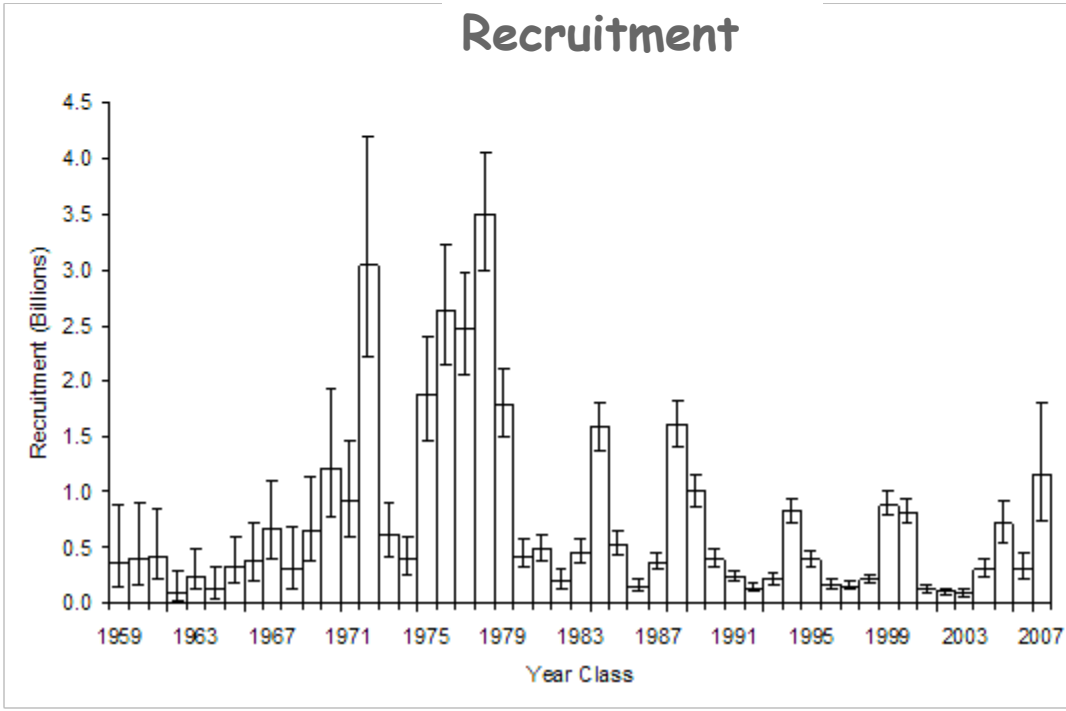
GOA pollock survey trends

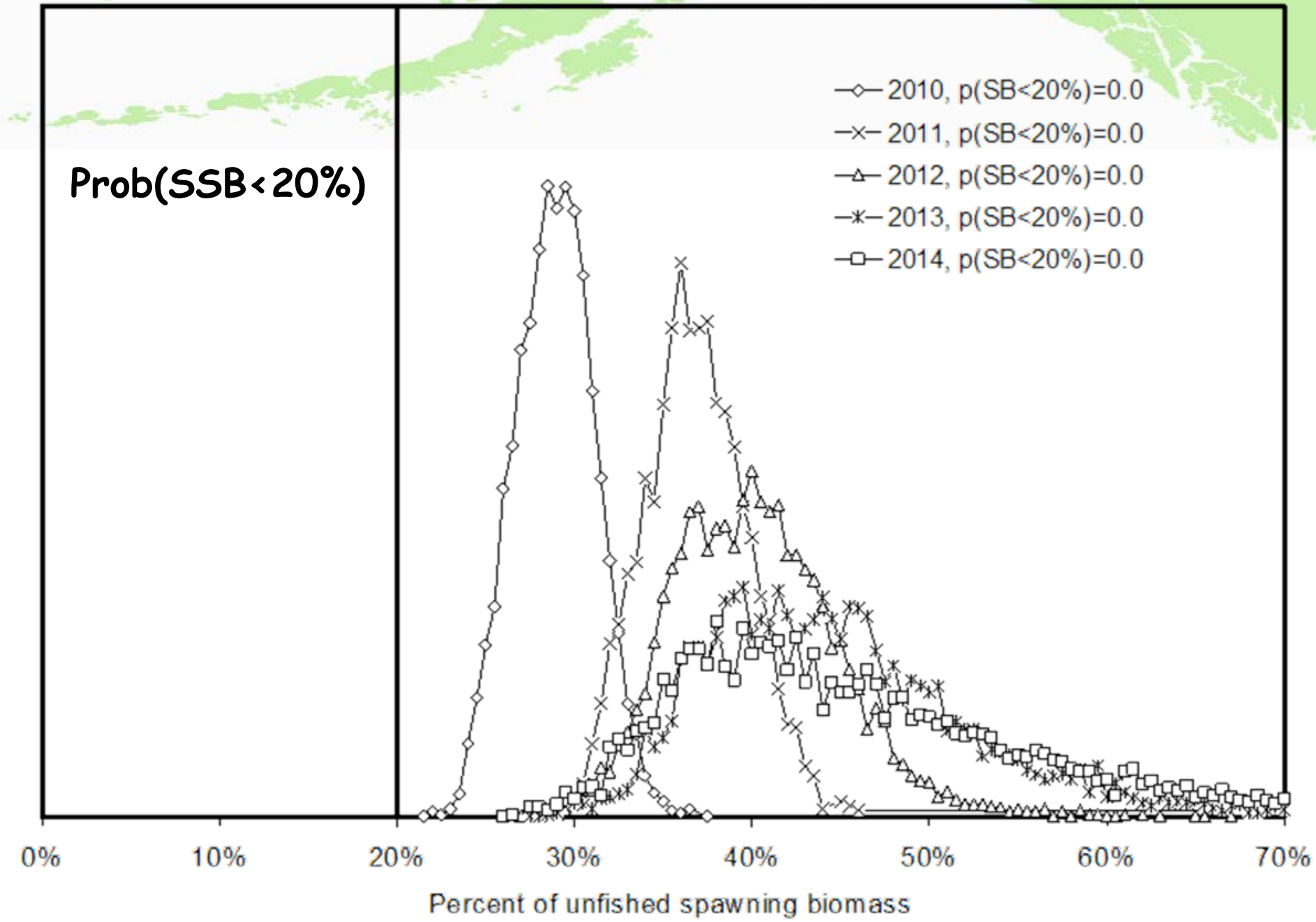


Relative trends in abundance indices, 1986-2009

GOA pollock model results

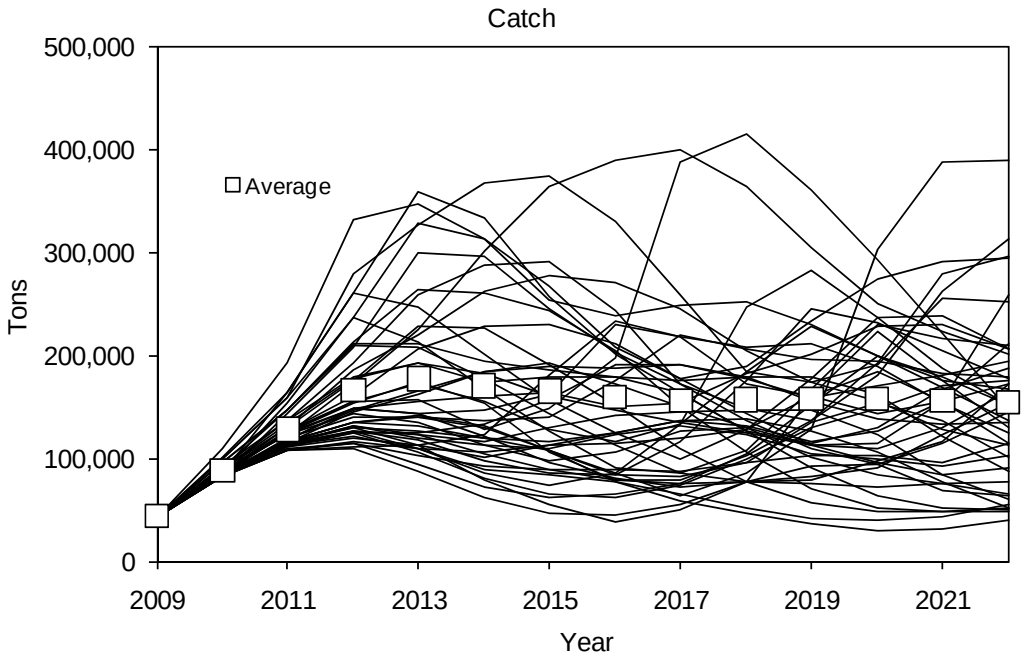




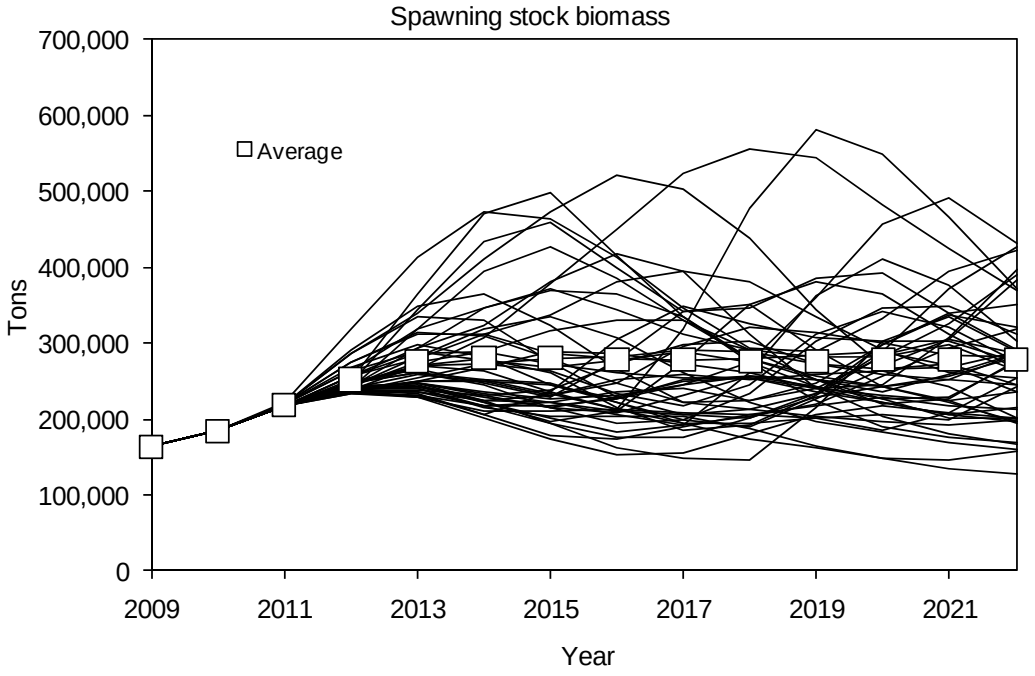

Prob(SSB<20%)
2010, p(SB<20%)=0.0
2011, p(SB<20%)=0.0
2012, p(SB<20%)=0.0
2013, p(SB<20%)=0.0
2014, p(SB<20%)=0.0
0%
10%
20%
30%
40%
50%
60%
70%
Percent of unfished spawning biomass

Variability in stock projections

Yield



Spawning biomass



GOA pollock ABC considerations

Recommendation conservative

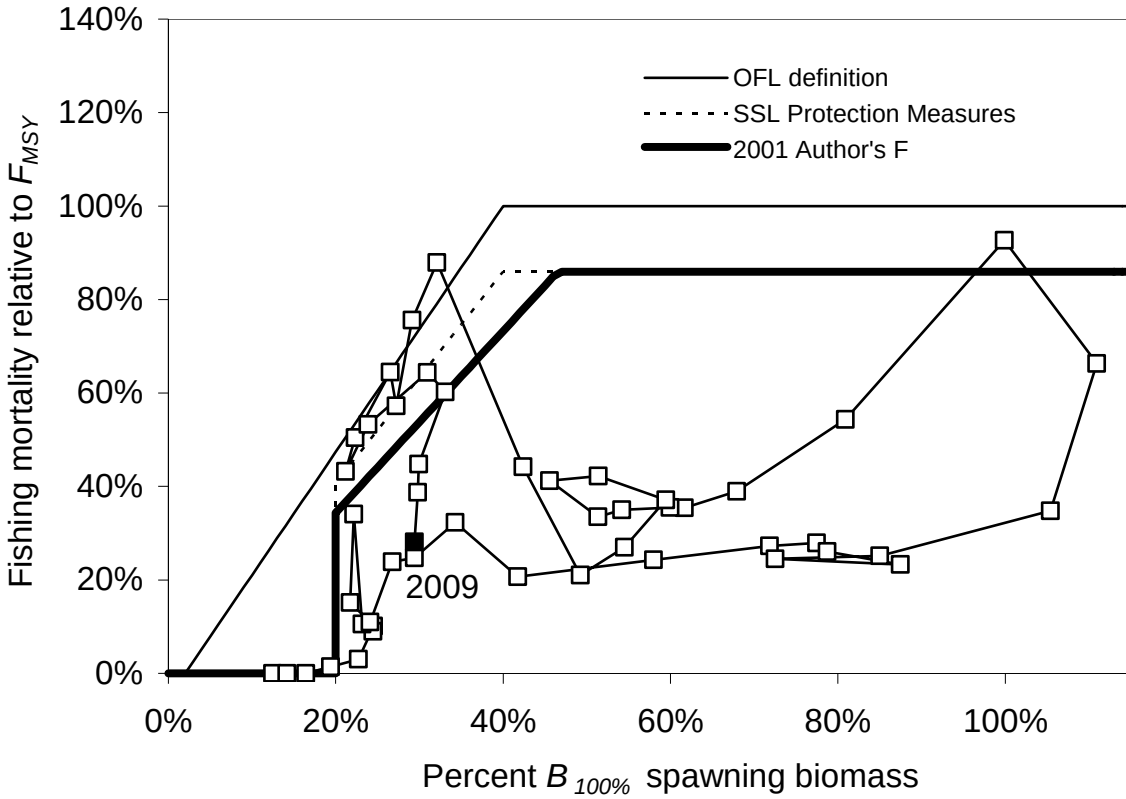
- ABC much higher if q estimated
- Harvest rate below maximum permissible FABC

Tier 3b

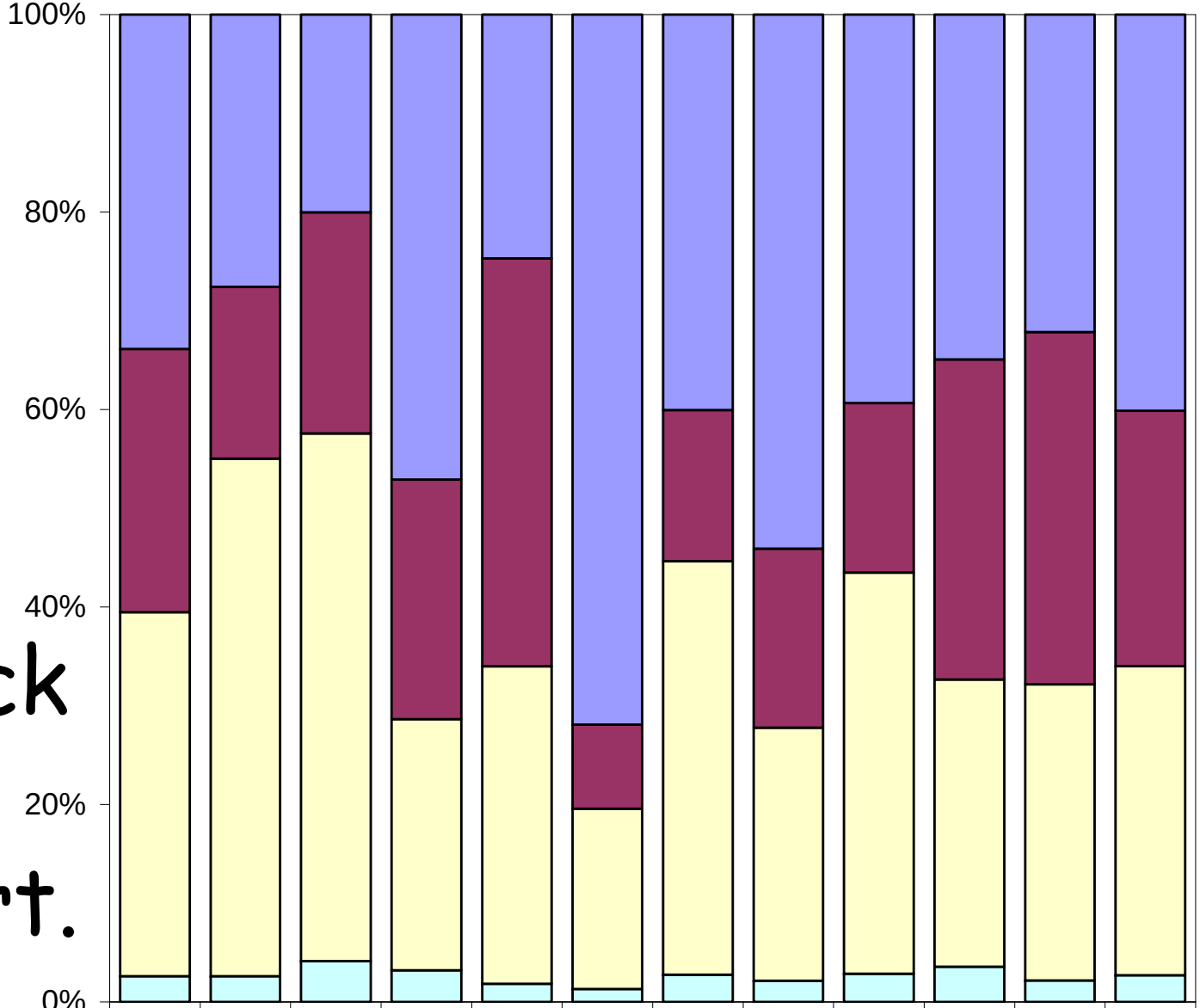
2010 SSB 30% of $B_{100\%}$

2009 year class apparently average abundance based on FOCI prediction

Pollock	Biomass	OFL	ABC
2010	797,638	115,536	84,745
2011		147,336	109,105



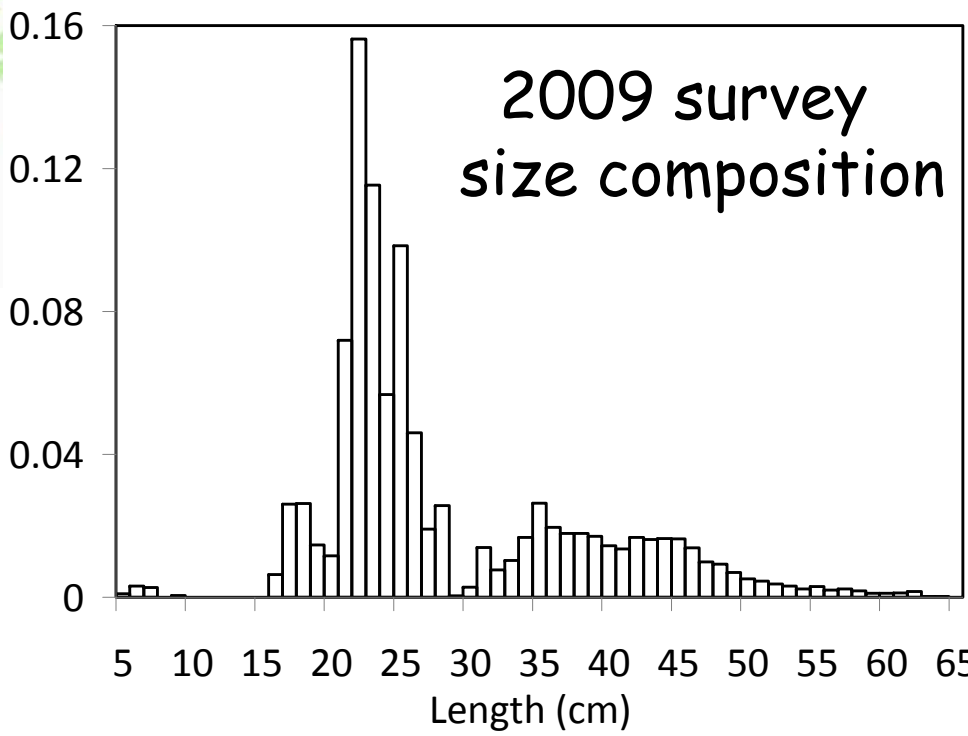
GOA pollock ABC apport.

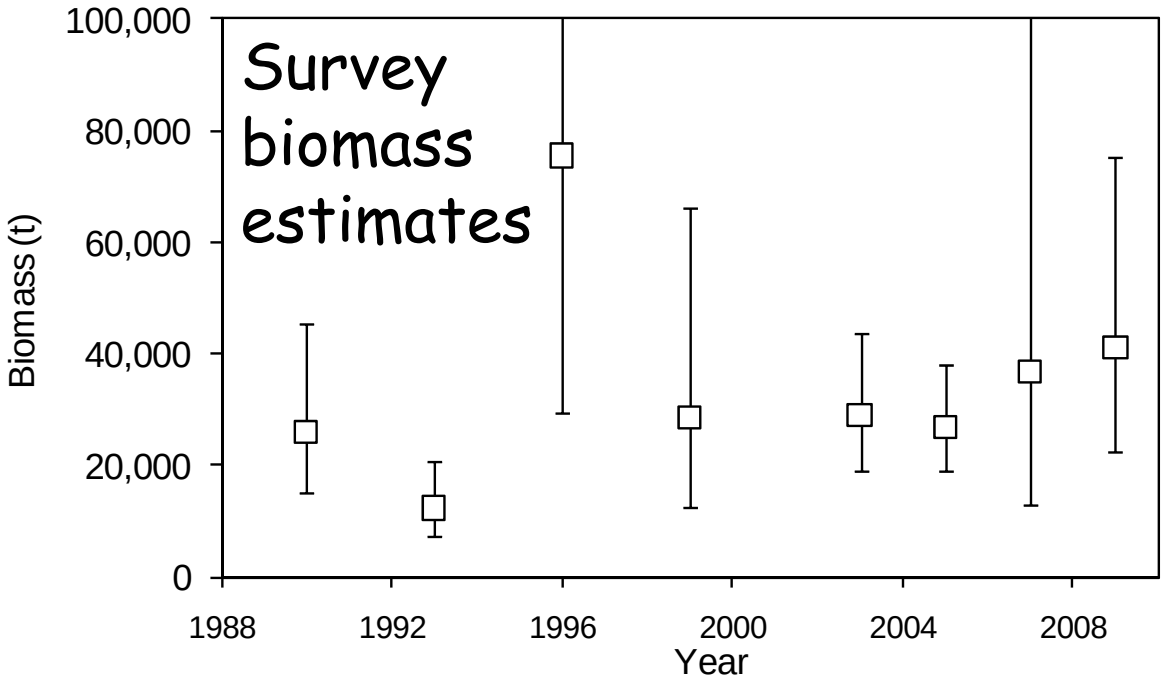


	1984	1987	1990	1993	1996	1999	2001	2003	2005	2007	2009	4 survey avg (2003-
Shumagin	33.88%	27.60%	20.03%	47.08%	24.69%	71.90%	40.06%	54.09%	39.35%	34.94%	32.16%	40.14%
Chirikof	26.64%	17.38%	22.41%	24.27%	41.32%	8.55%	15.30%	18.14%	17.16%	32.42%	35.66%	25.84%
Kodiak	36.87%	52.40%	53.42%	25.44%	32.16%	18.23%	41.88%	25.62%	40.64%	29.06%	29.99%	31.32%
West Yak.	2.62%	2.62%	4.13%	3.20%	1.83%	1.32%	2.76%	2.15%	2.85%	3.59%	2.18%	2.69%

EGOA pollock (Tier 5)

EGOA Pollock	Biomass	OFL	ABC
2010	41,088	12,326	9,245
2011		12,326	9,245





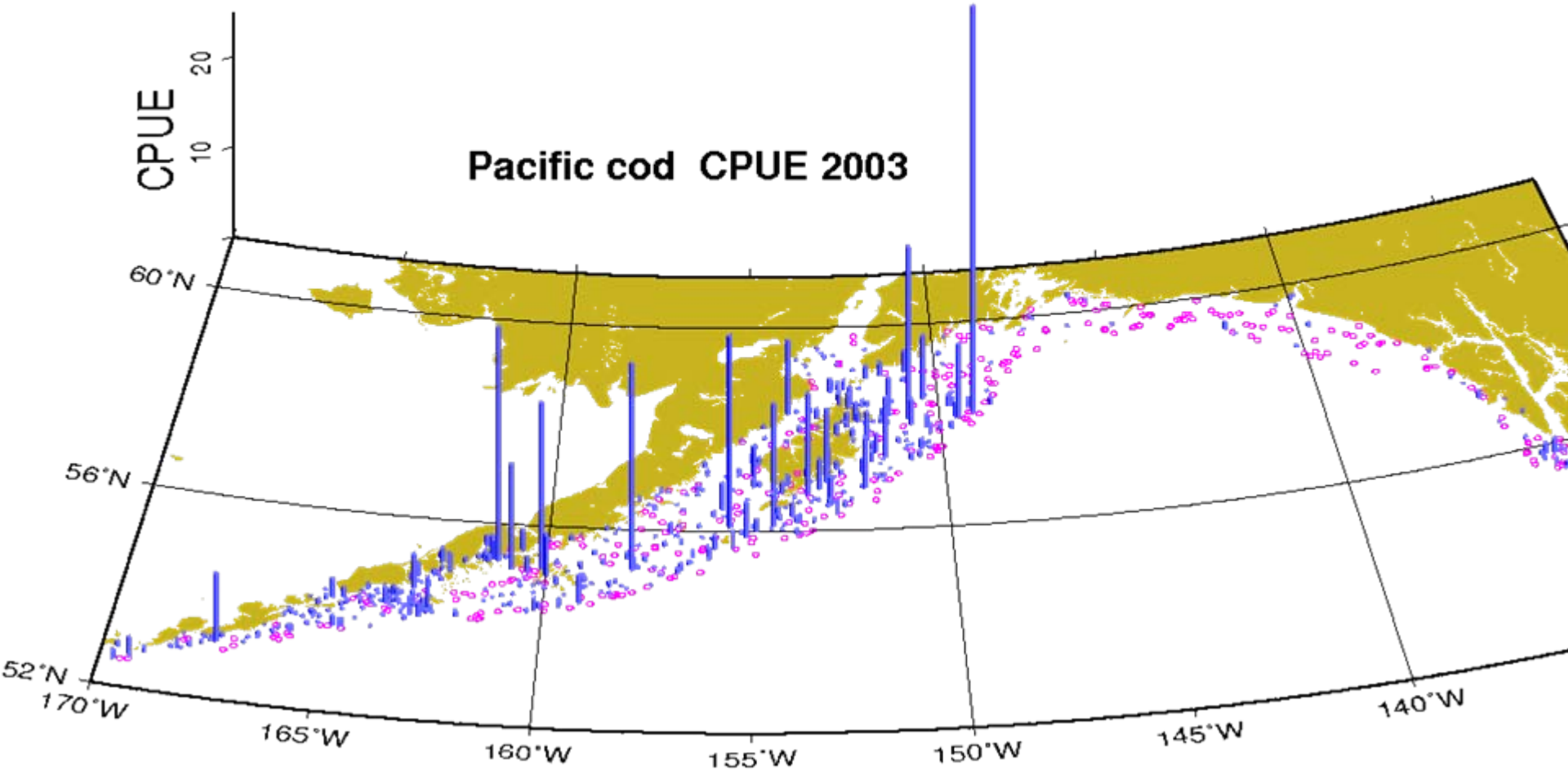
Nearly 1,000 t increase from 2007

ABC Summary
Pacific cod

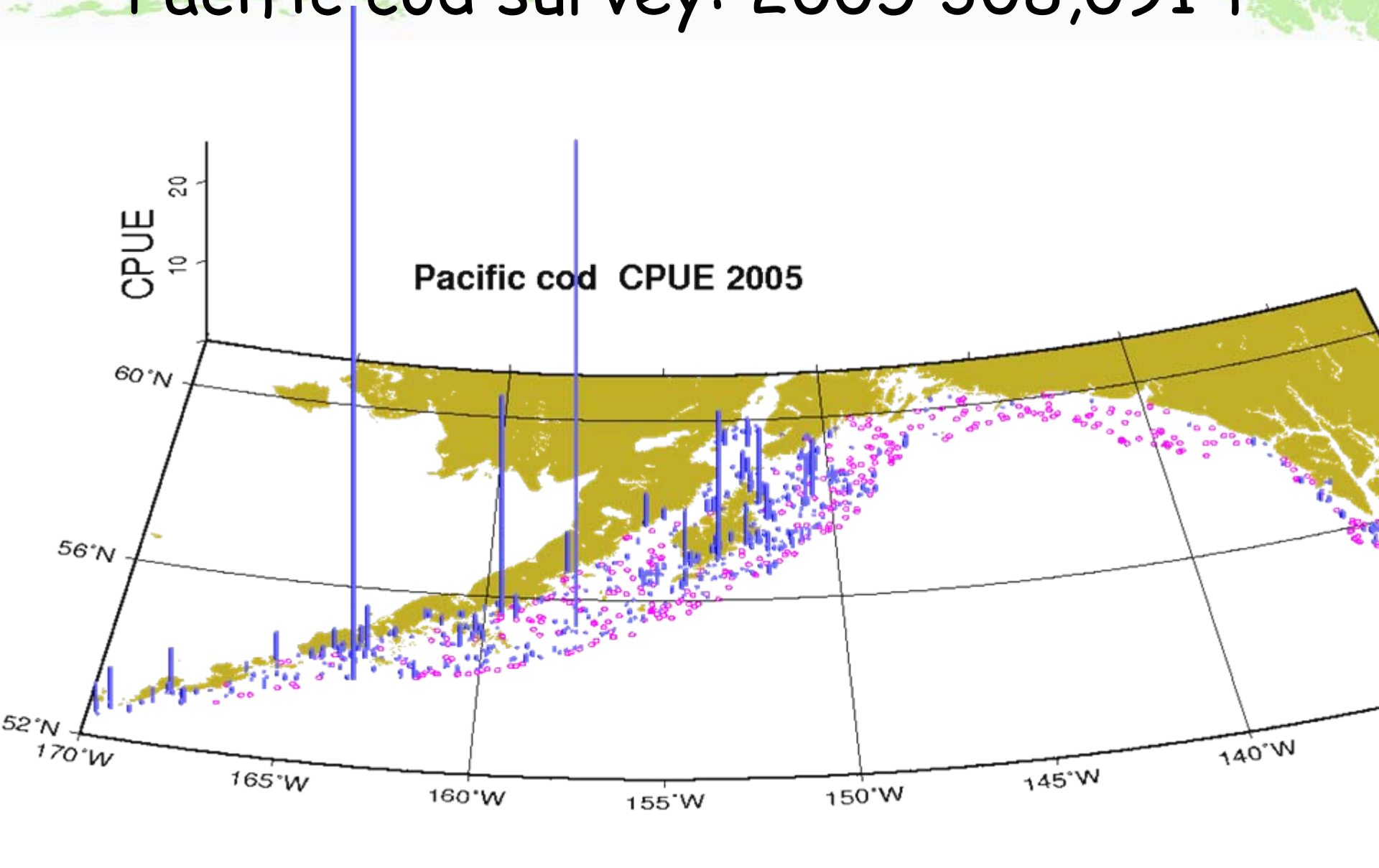
Species	2009 Catch	ABC 2009	ABC 2010	Change	
Pollock	42,297	49,900	84,745	up 34,845	(70%)
Pacific Cod	38,401	55,300	79,100	up 23,800	(43%)
Sablefish	10,698	11,160	10,370	down 790	(7%)
Flatfish	16,657	125,617	119,583	down 6,034	(5%)
Arrowtooth flounder	24,438	221,512	215,882	down 5,630	(3%)
Rockfish	22,408	33,005	35,773	up 2,768	(8%)
Atka mackerel	2,221	4,700	4,700	same	(0%)
Skates	3,935	8,321	8,273	down 48	(1%)
Other Species	2,327	6,540	7,075	up 535	(8%)
Total	163,382	516,055	565,501	up 49,446	(11%)

Summary: Page 17
Chapter: Page 165

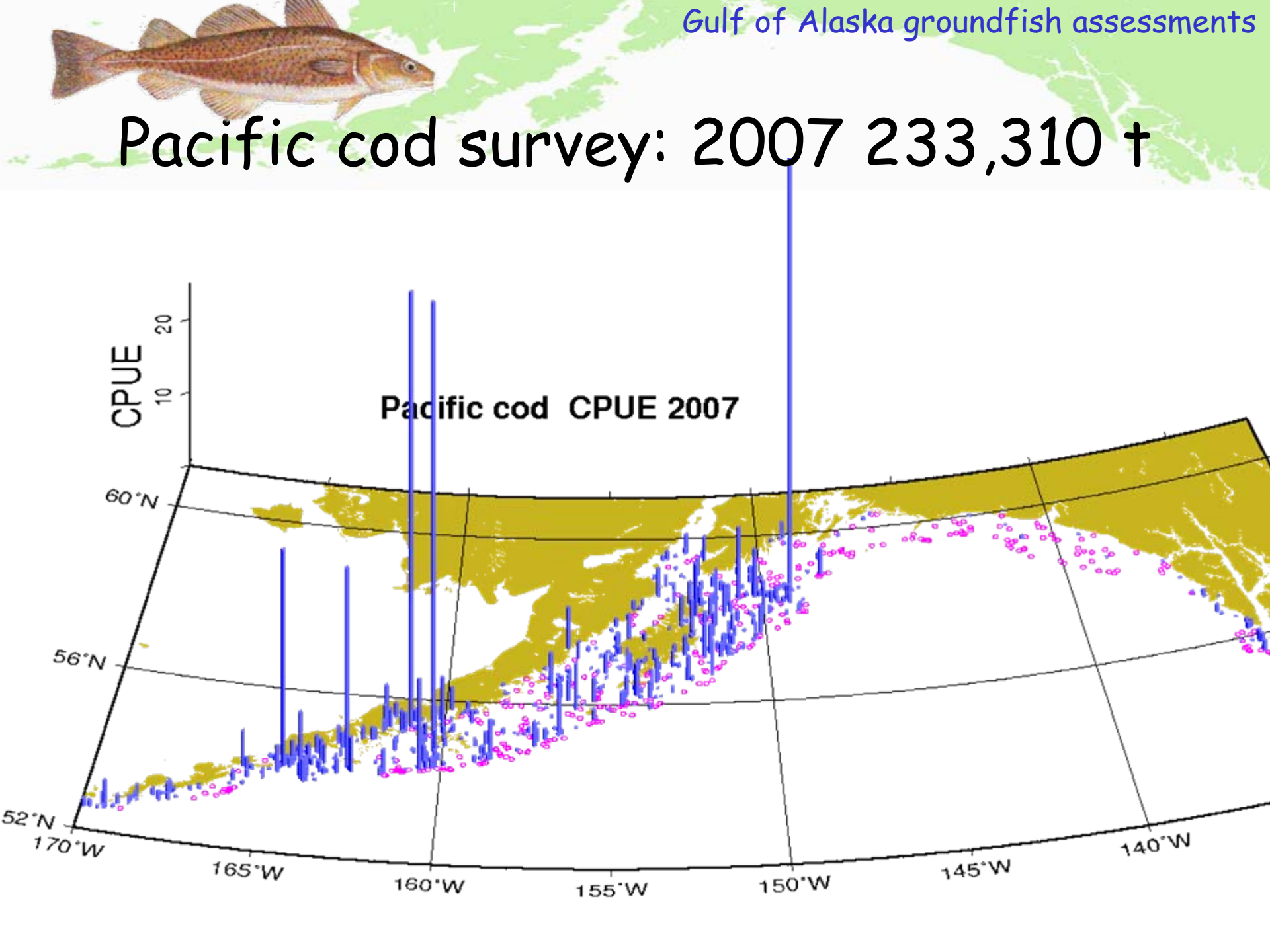
Pacific cod survey: 2003 297,402 t



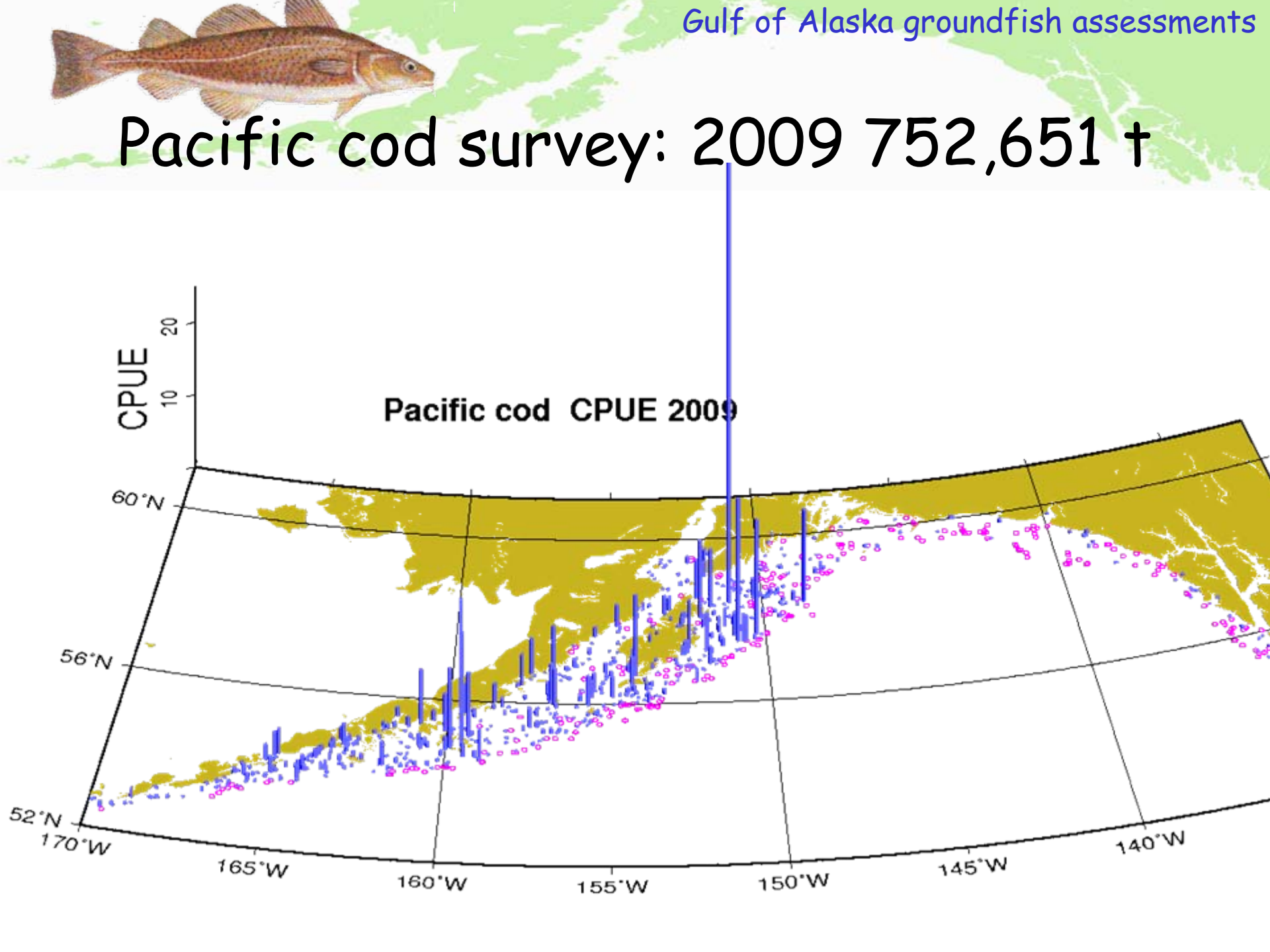
Pacific cod survey: 2005 308,091 t



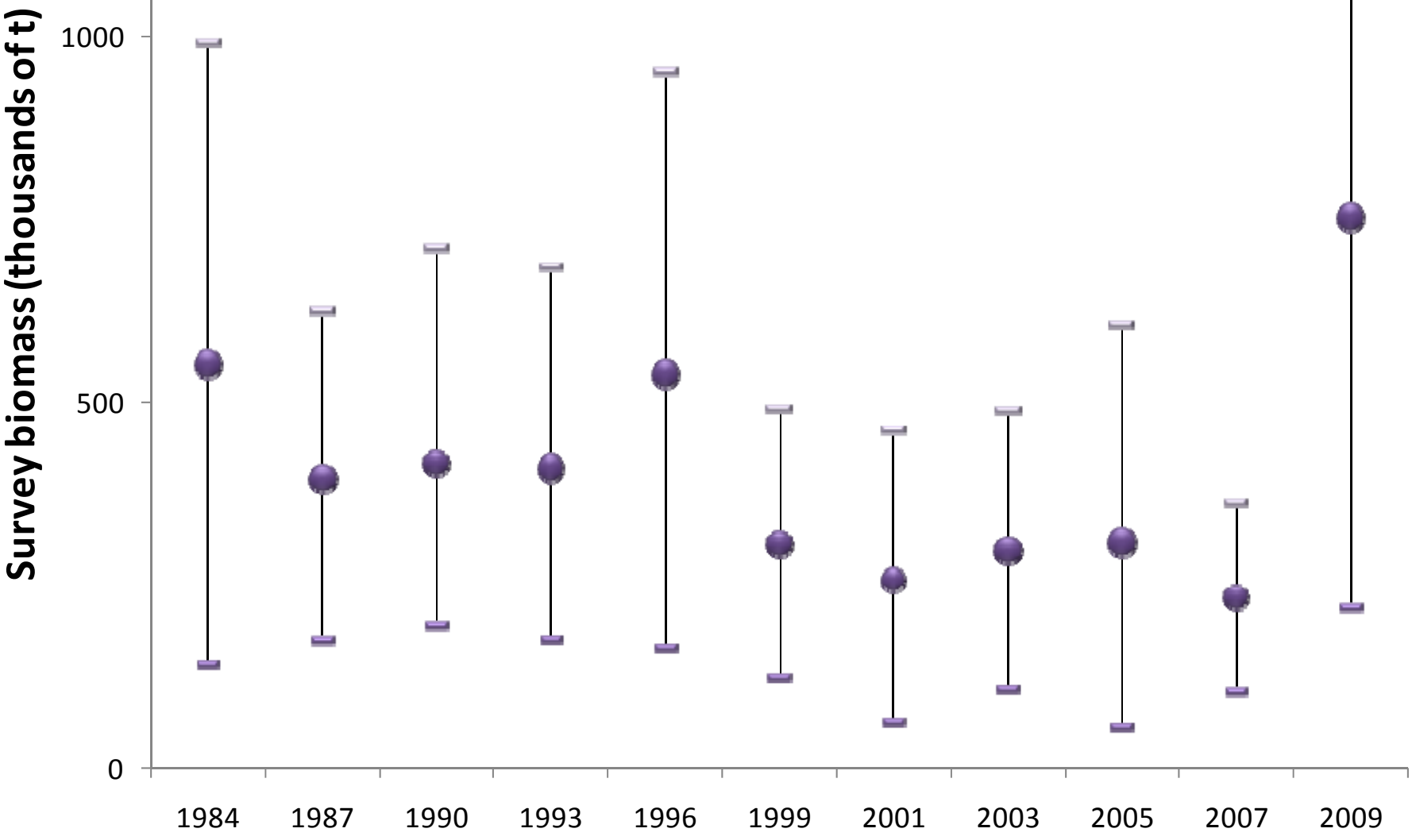
Pacific cod survey: 2007 233,310 t



Pacific cod survey: 2009 752,651 t

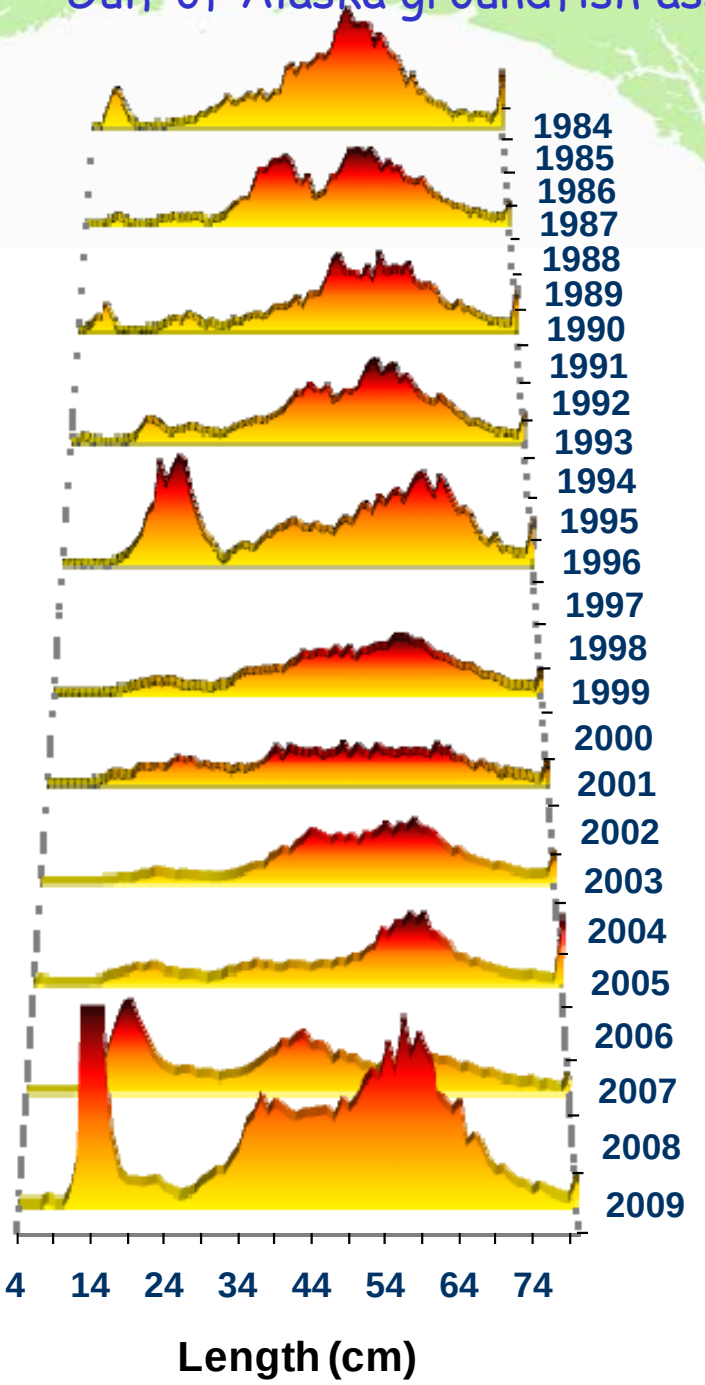


Pacific cod survey biomass estimates



Pacific cod

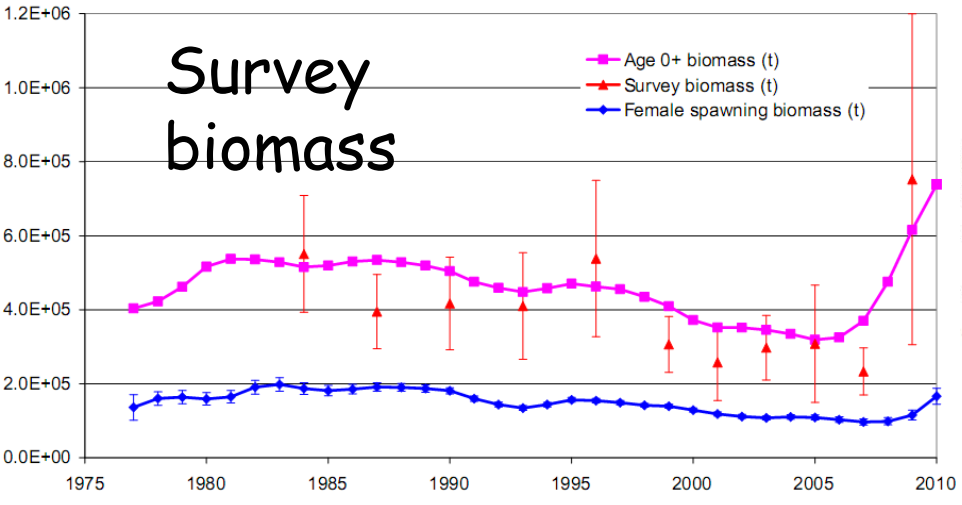
Survey abundance at-length

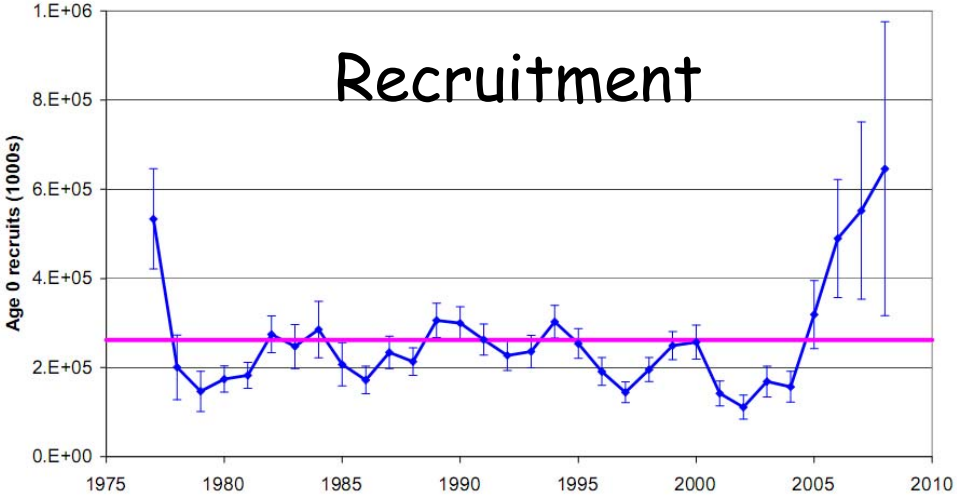


Pacific cod ABC/TAC

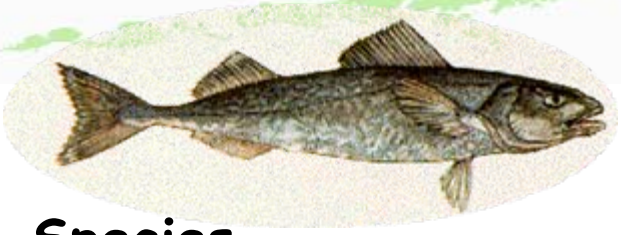
- **Tier 3a**
  - SSB slightly above $B_{40\%}$ for 2010

Pacific cod	Biomass	OFL	ABC
2010	701,200	94,100	79,100
2011		116,700	97,900





ABC Summary
Sablefish



Species	2009 Catch	ABC 2009	ABC 2010	Change	
Pollock	42,297	49,900	84,745	up 34,845	(70%)
Pacific Cod	38,401	55,300	79,100	up 23,800	(43%)
Sablefish	10,698	11,160	10,370	down 790	(7%)
Flatfish	16,657	125,617	119,583	down 6,034	(5%)
Arrowtooth flounder	24,438	221,512	215,882	down 5,630	(3%)
Rockfish	22,408	33,005	35,773	up 2,768	(8%)
Atka mackerel	2,221	4,700	4,700	same	(0%)
Skates	3,935	8,321	8,273	down 48	(1%)
Other Species	2,327	6,540	7,075	up 535	(8%)
Total	163,382	516,055	565,501	up 49,446	(11%)

Summary: Page 19
Chapter: Page 353

2009 sablefish assessment overview

Model

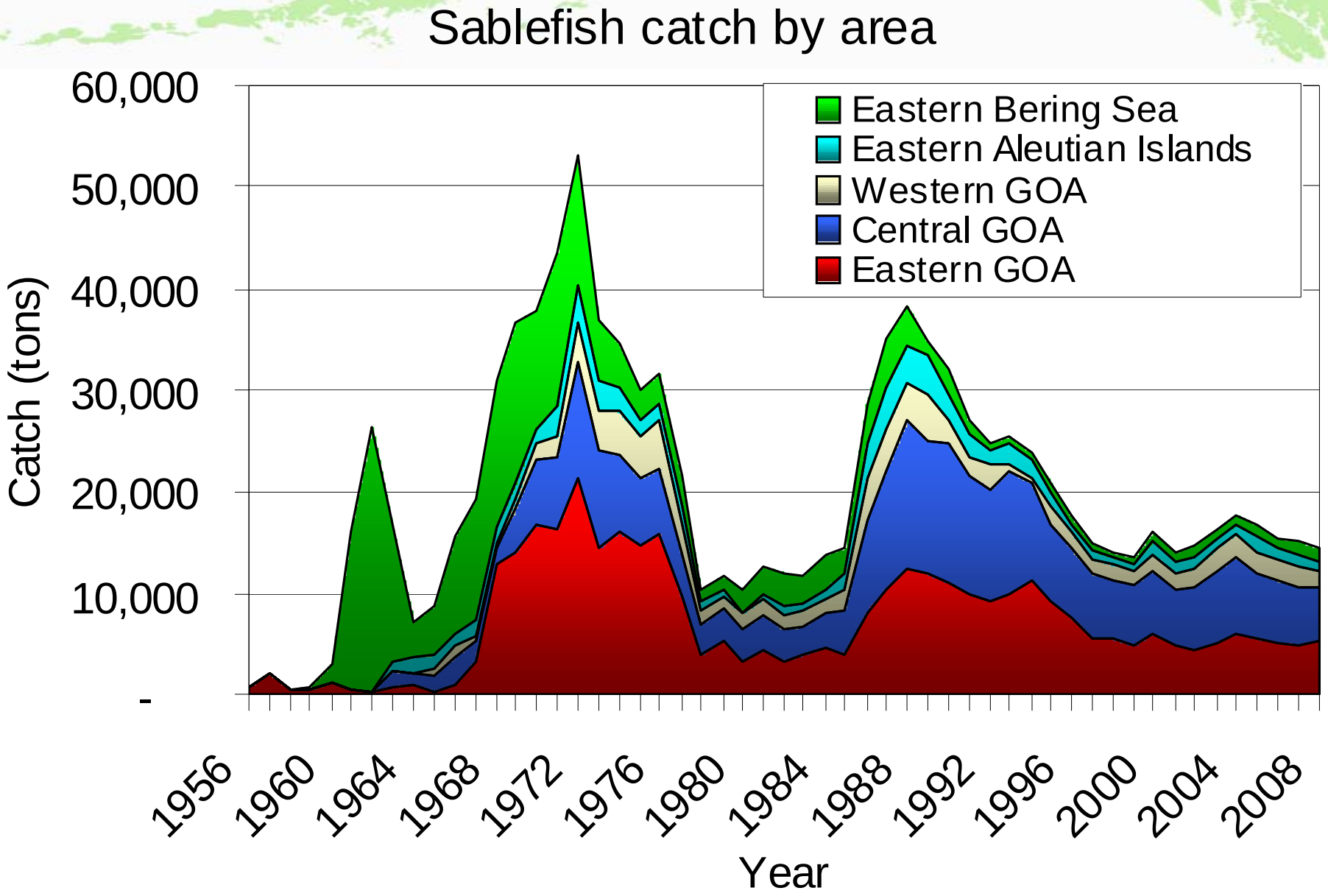
No changes for 2009

Modeling/data workshop planned for winter 2010

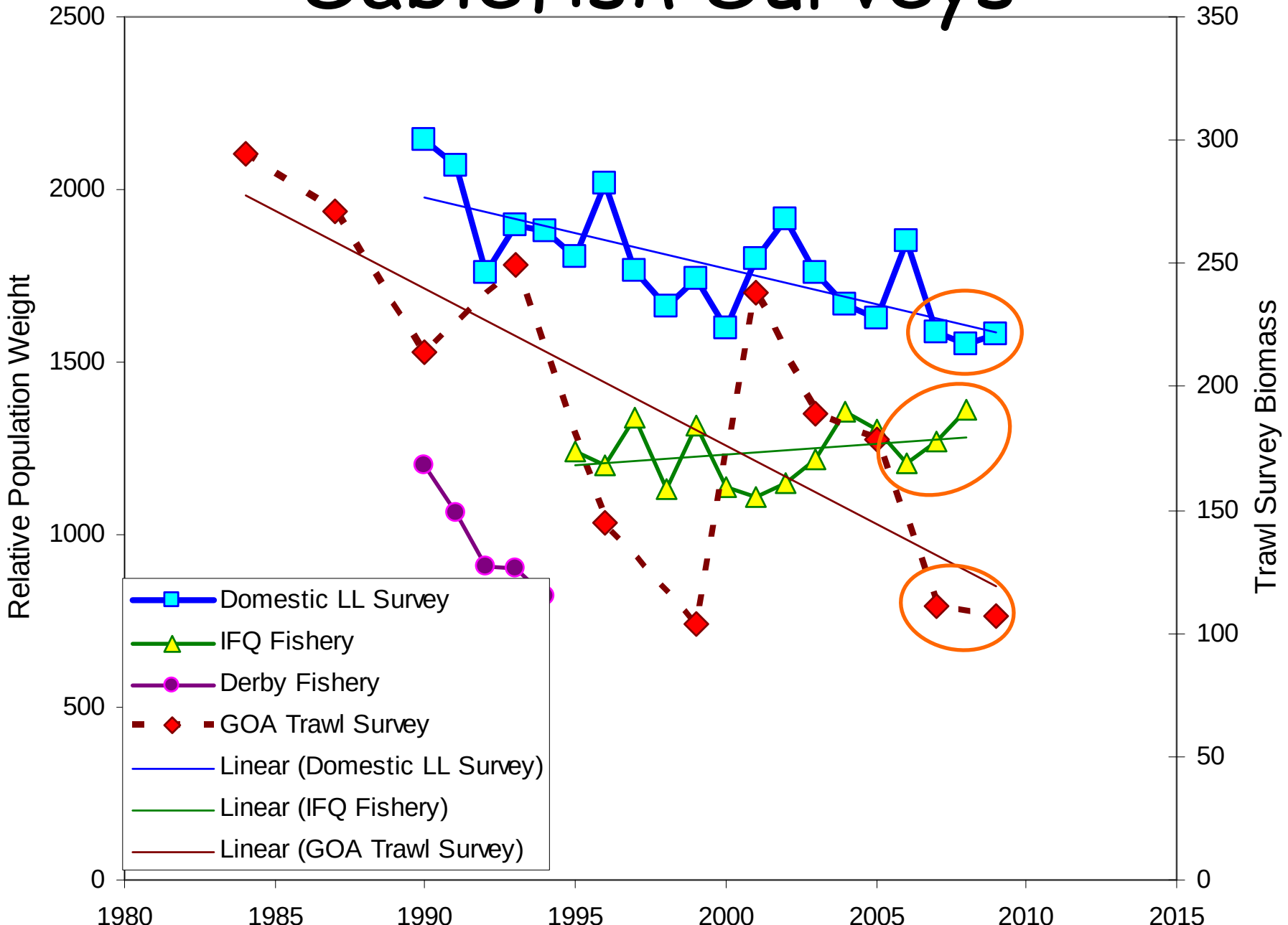
Data updates

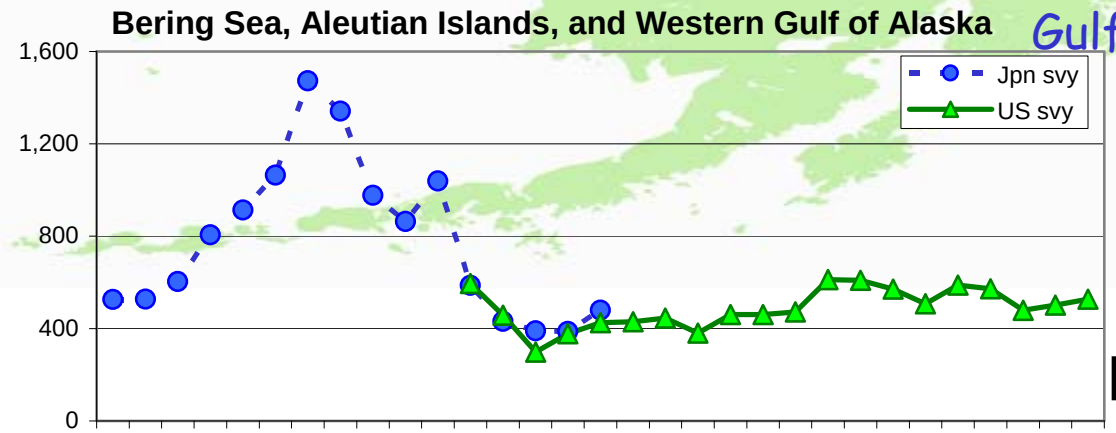
Catch:	updated 2008, and new catch for 2009
Abundance:	2009 Longline survey
	2008 Longline fishery
	2009 GOA trawl survey
Ages:	2008 Longline survey
	2008 Longline fishery
Lengths:	2009 Longline survey
	2008 Longline fishery
	2008 Trawl fishery
	2009 Trawl survey

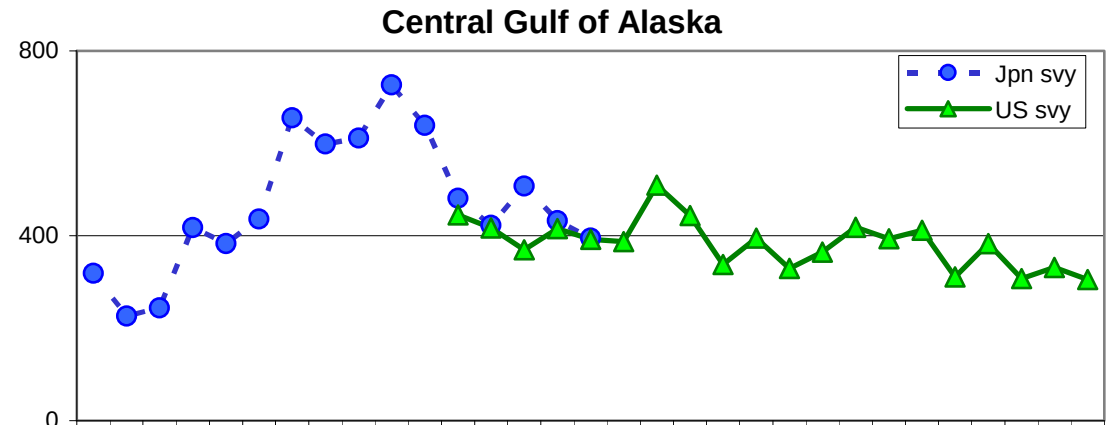
Sablefish Catch by Area

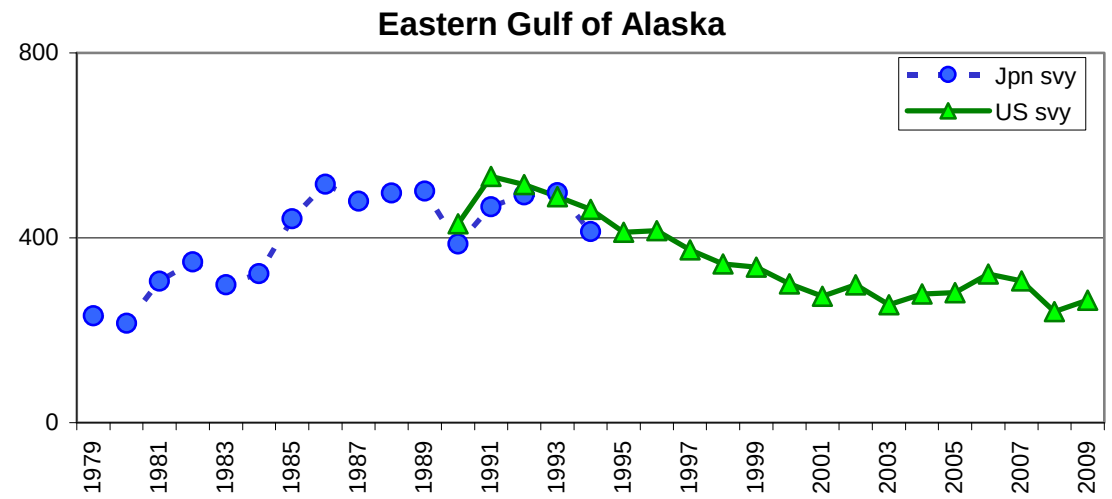


Sablefish Surveys







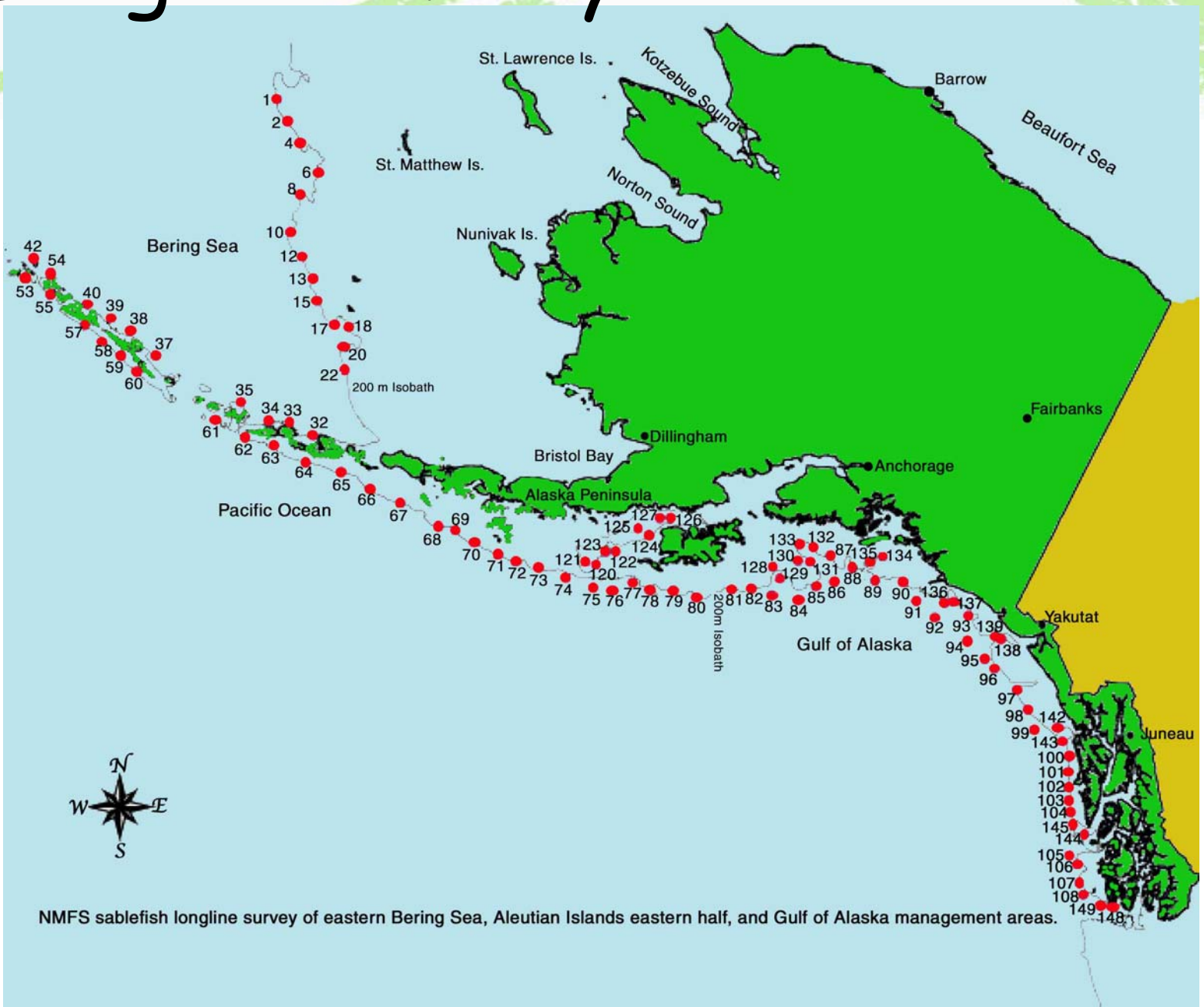


Longline survey by area…

Bering Sea survey

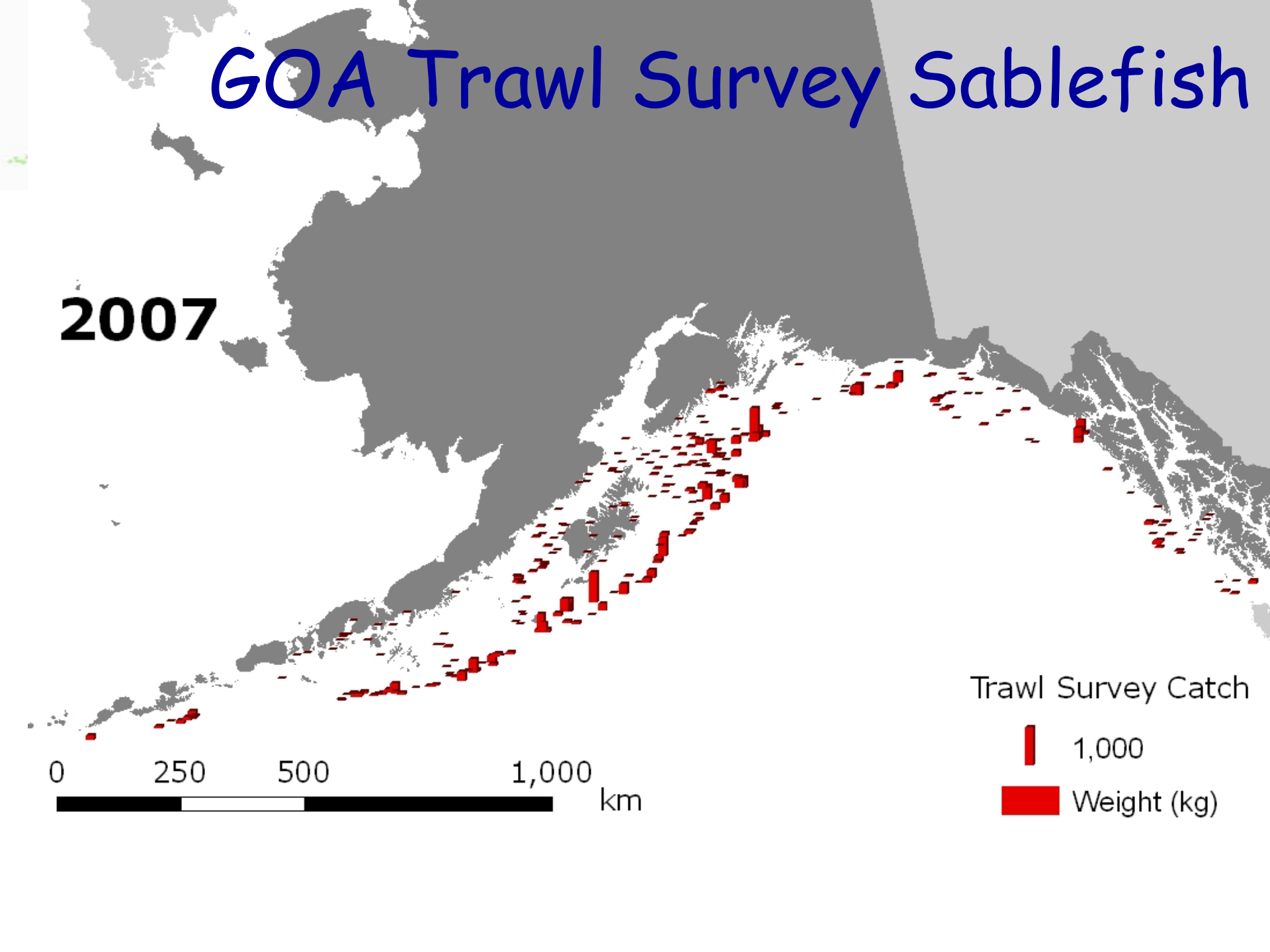
- High killer whale depredation
- Only 6 of 16 stations free of killer whales
- 5 of 6 of these were generally low-density stations
- Further dropped abundance ~80%
- Used GOA trend applied to last BS survey (2007)

Longline survey

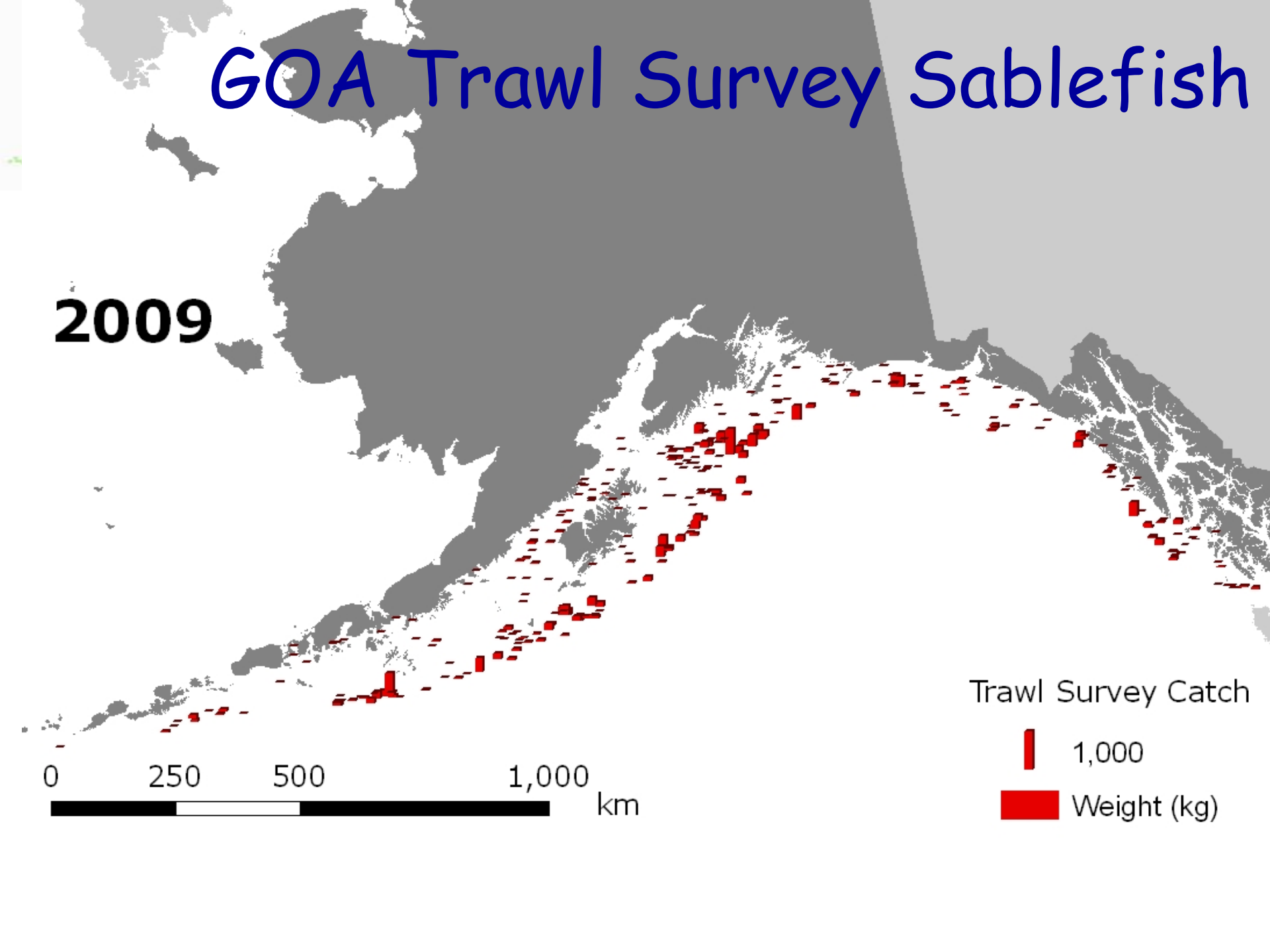


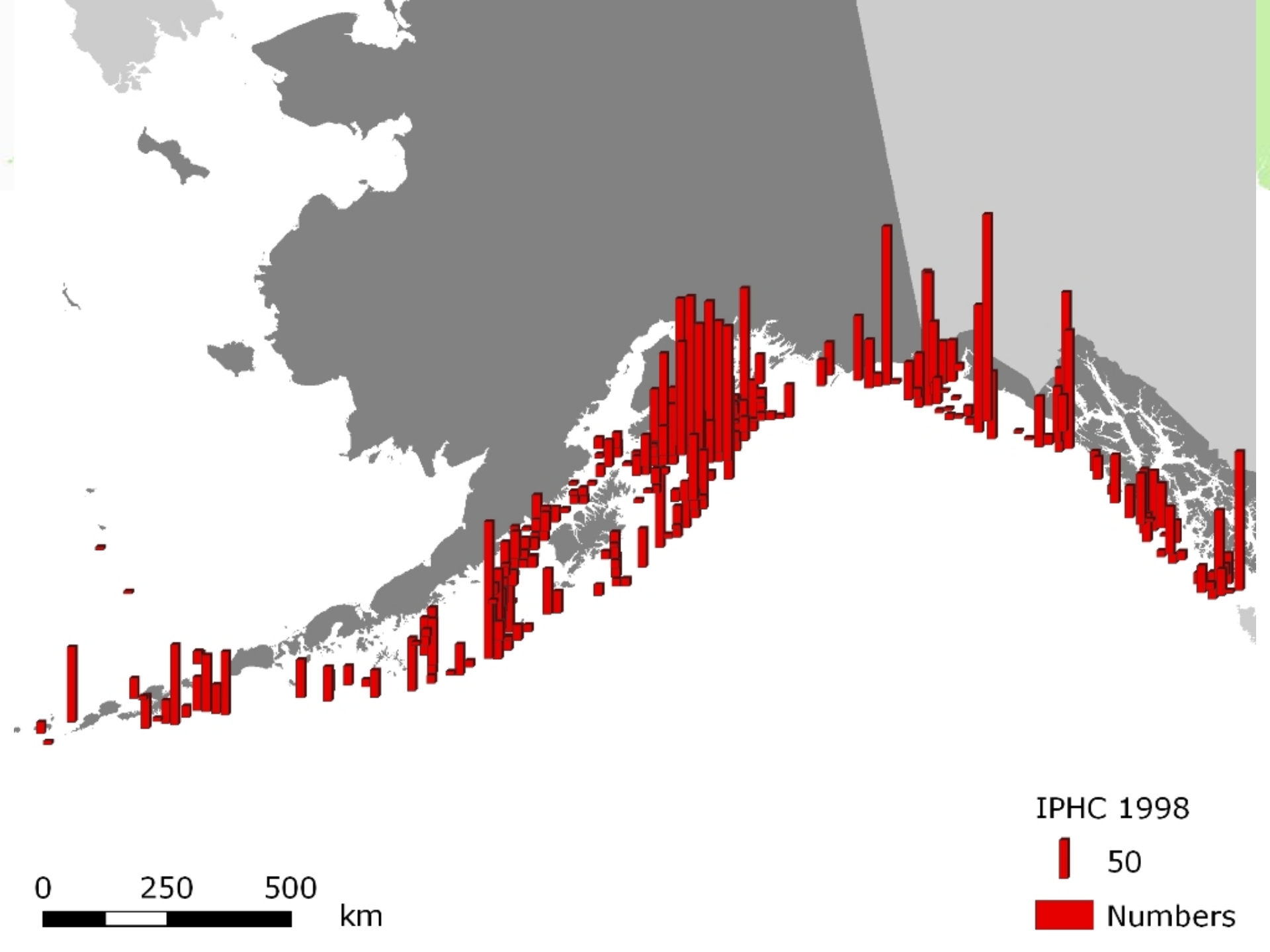
NMFS sablefish longline survey of eastern Bering Sea, Aleutian Islands eastern half, and Gulf of Alaska management areas.

GOA Trawl Survey Sablefish

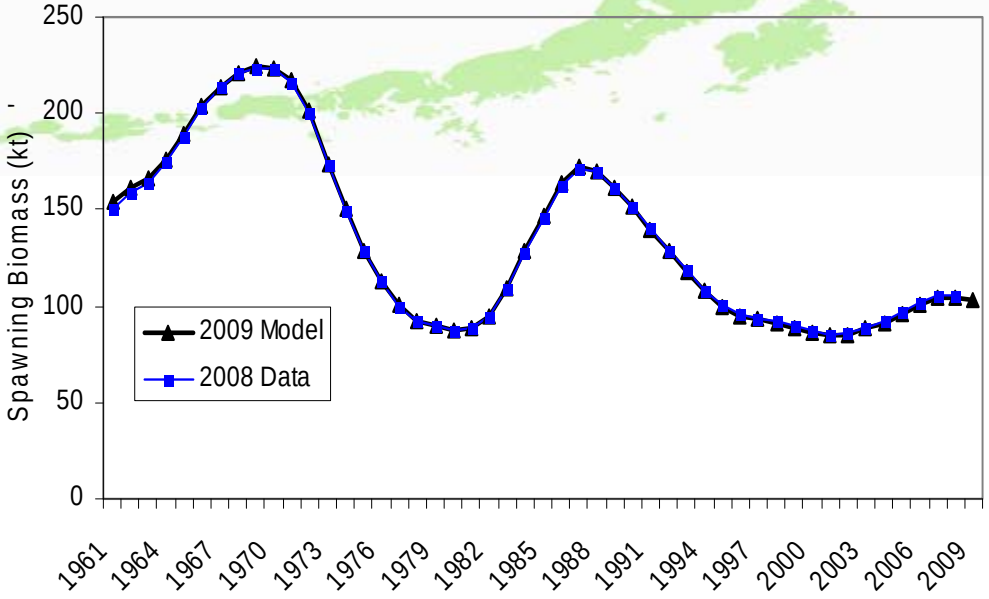


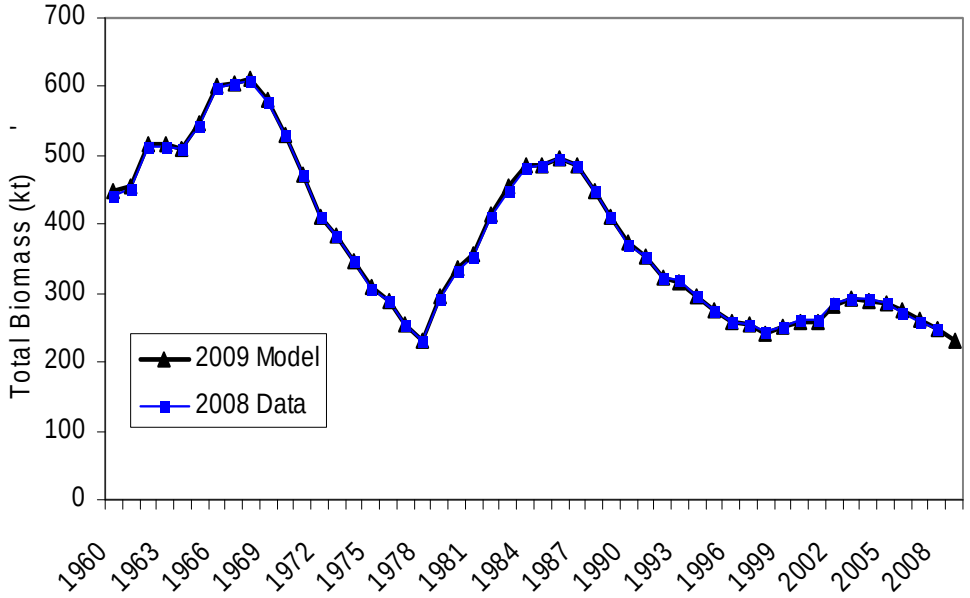
GOA Trawl Survey Sablefish




IPHC 1998
50
Numbers
0
250
500
km

Trends



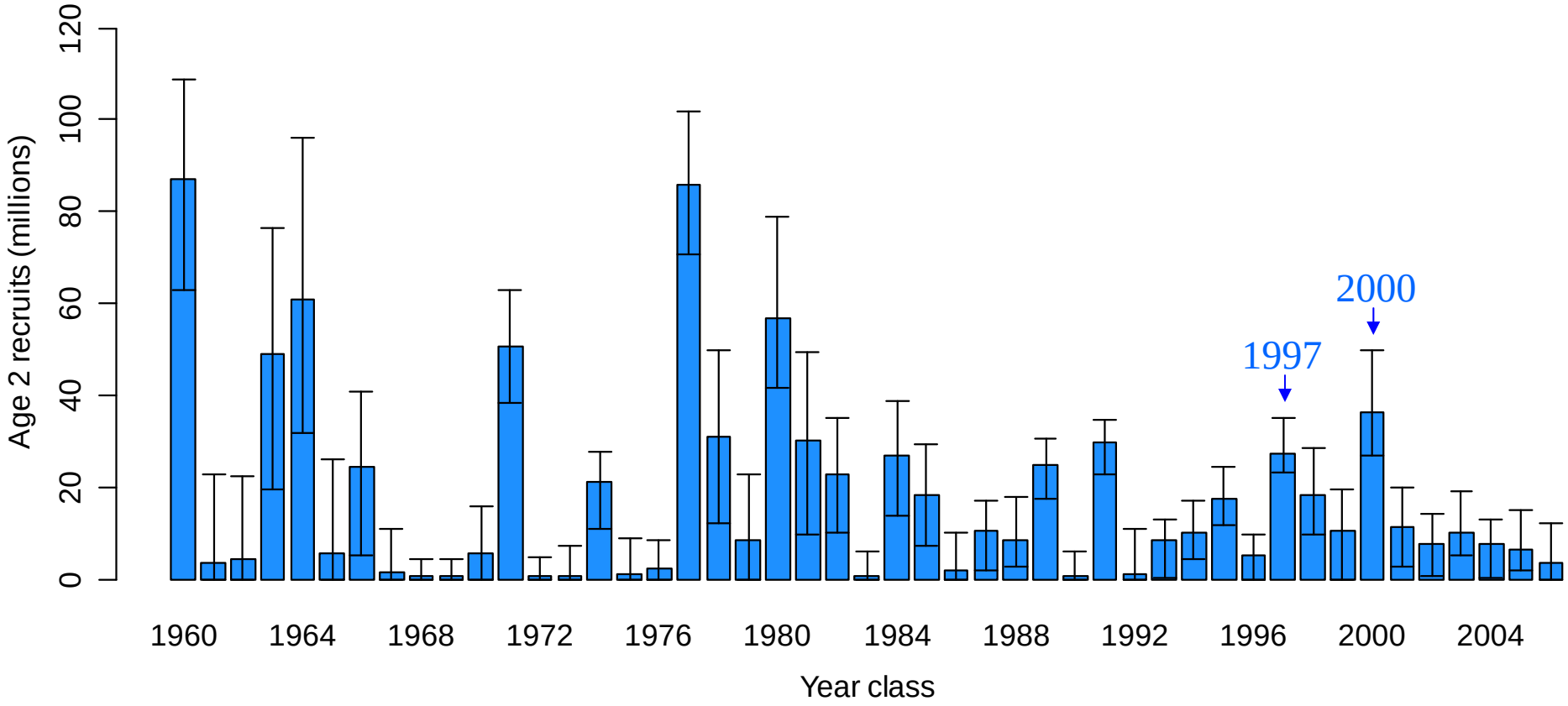


Spawning biomass leveling off

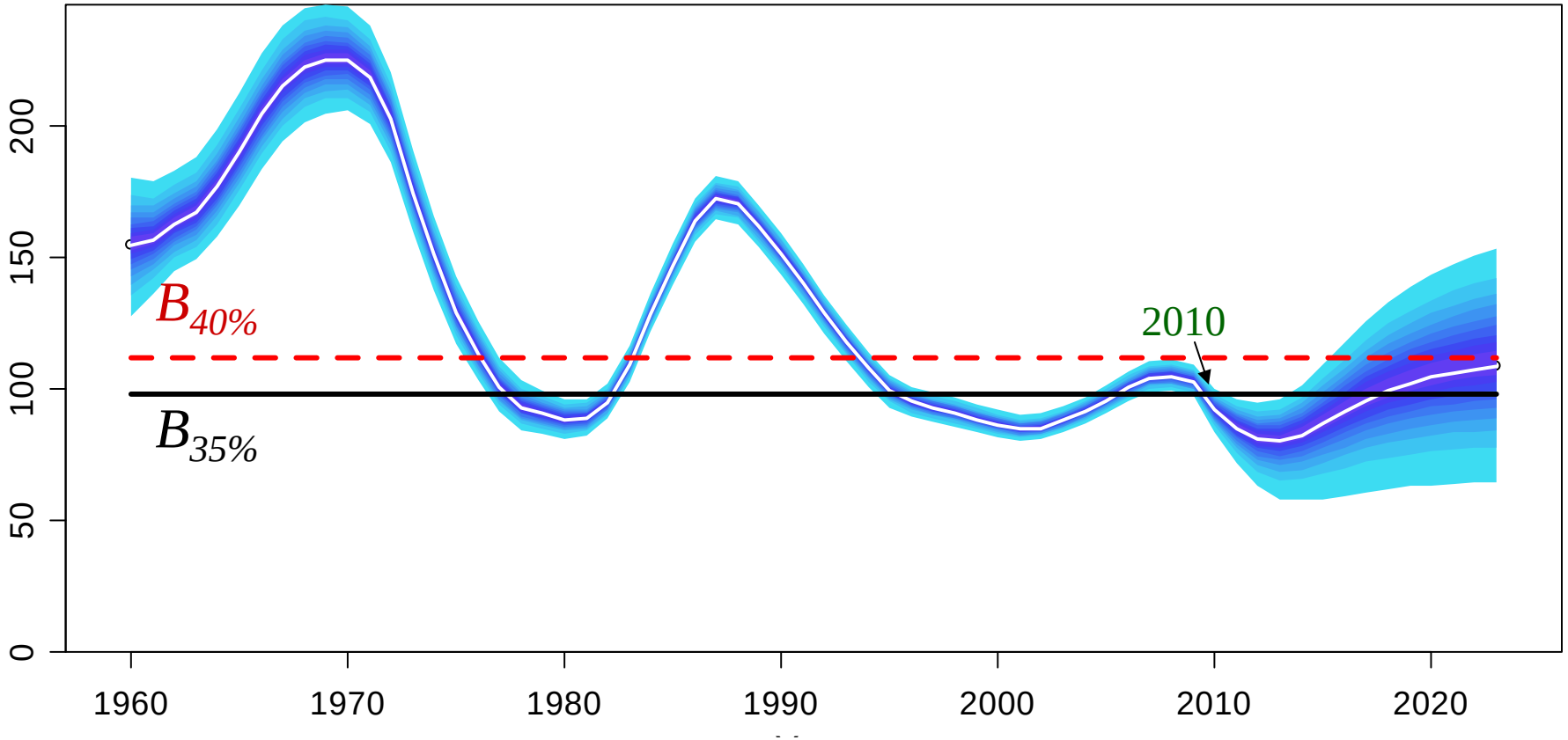
Total biomass declining

- Likely to continue until new year class appears

Sablefish: Recruitment



Sablefish: Projection



Sablefish ABC/OFL

2010 spawning biomass 36% of $B_{100\%}$

Tier 3b Alaska-wide ABC:

ABC 2009: 16,080 t

ABC 2010: 15,230 t (vs. 14,895 projected)

- 5 % decrease

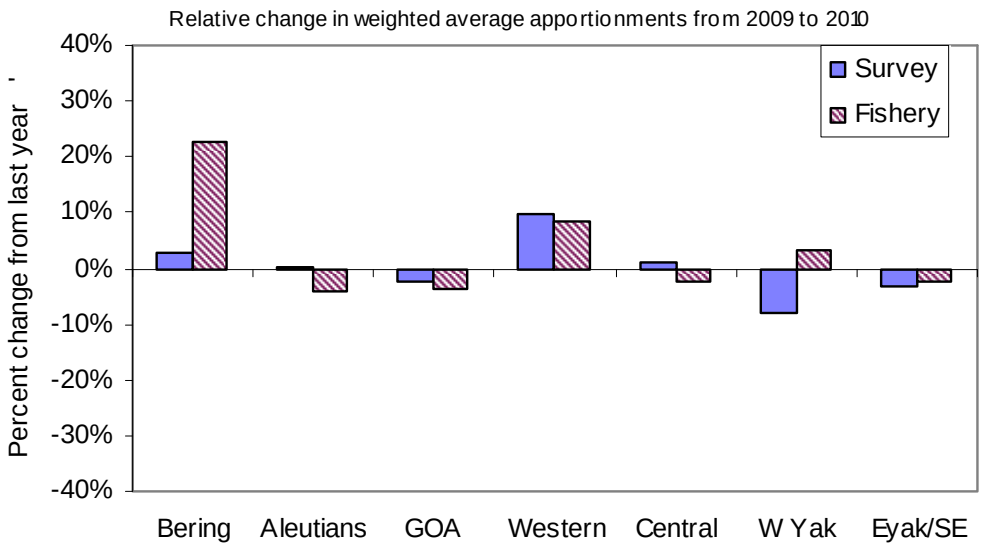
May continue

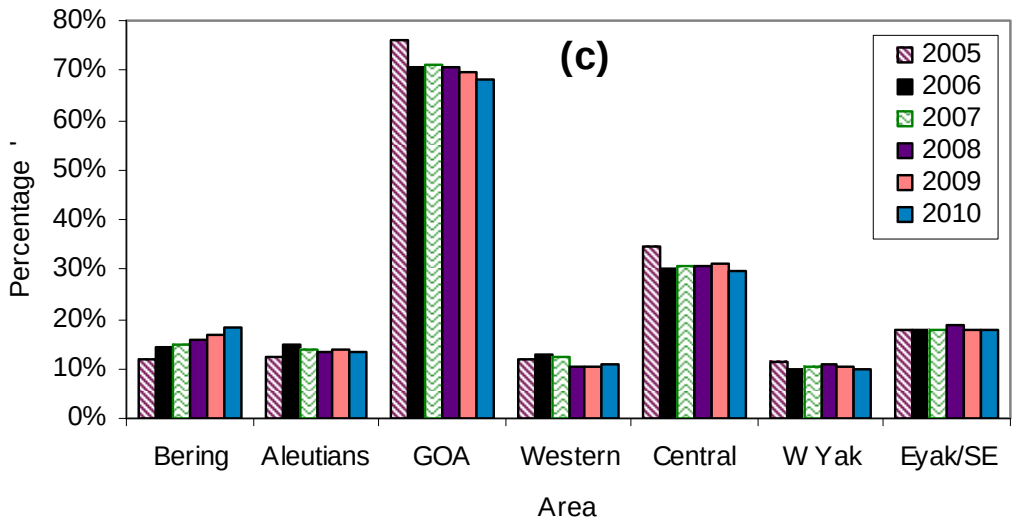
13,660 projected for 2011

GOA specific

Sablefish	Biomass	OFL	ABC
2010	140,000	12,270	10,370
2011		11,008	9,300

Sablefish: Apportionment



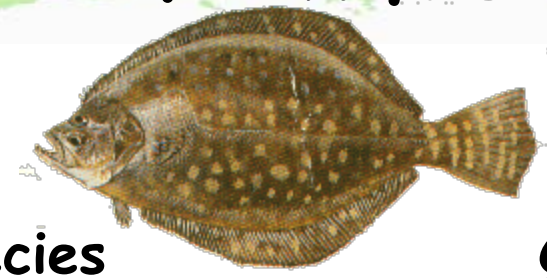


- **Central Gulf and WYAK down most**
  - down 9-10%
- **WGOA and BS rise**
  - up 1 and 3%
- **AI and EYAK decline in line with overall**

The future

- **Implement CIE suggestions**
- **Sablefish workshop this winter**
  - Spatial models
  - Revise Fishery index
  - Survey indices
  - Stock synthesis as alternative model software

Flatfish ABC Summary



Species	2009 Catch	ABC 2009	ABC 2010	Change	
Pollock	42,297	49,900	84,745	up 34,845	(70%)
Pacific Cod	38,401	55,300	79,100	up 23,800	(43%)
Sablefish	10,698	11,160	10,370	down 790	(7%)
Flatfish	16,657	125,617	119,583	down 6,034	(5%)
Arrowtooth flounder	24,438	221,512	215,882	down 5,630	(3%)
Rockfish	22,408	33,005	35,773	up 2,768	(8%)
Atka mackerel	2,221	4,700	4,700	same	(0%)
Skates	3,935	8,321	8,273	down 48	(1%)
Other Species	2,327	6,540	7,075	up 535	(8%)
Total	163,382	516,055	565,501	up 49,446	(11%)

Summary: Page 21 Chapter: Page 465

Flatfish ABC's

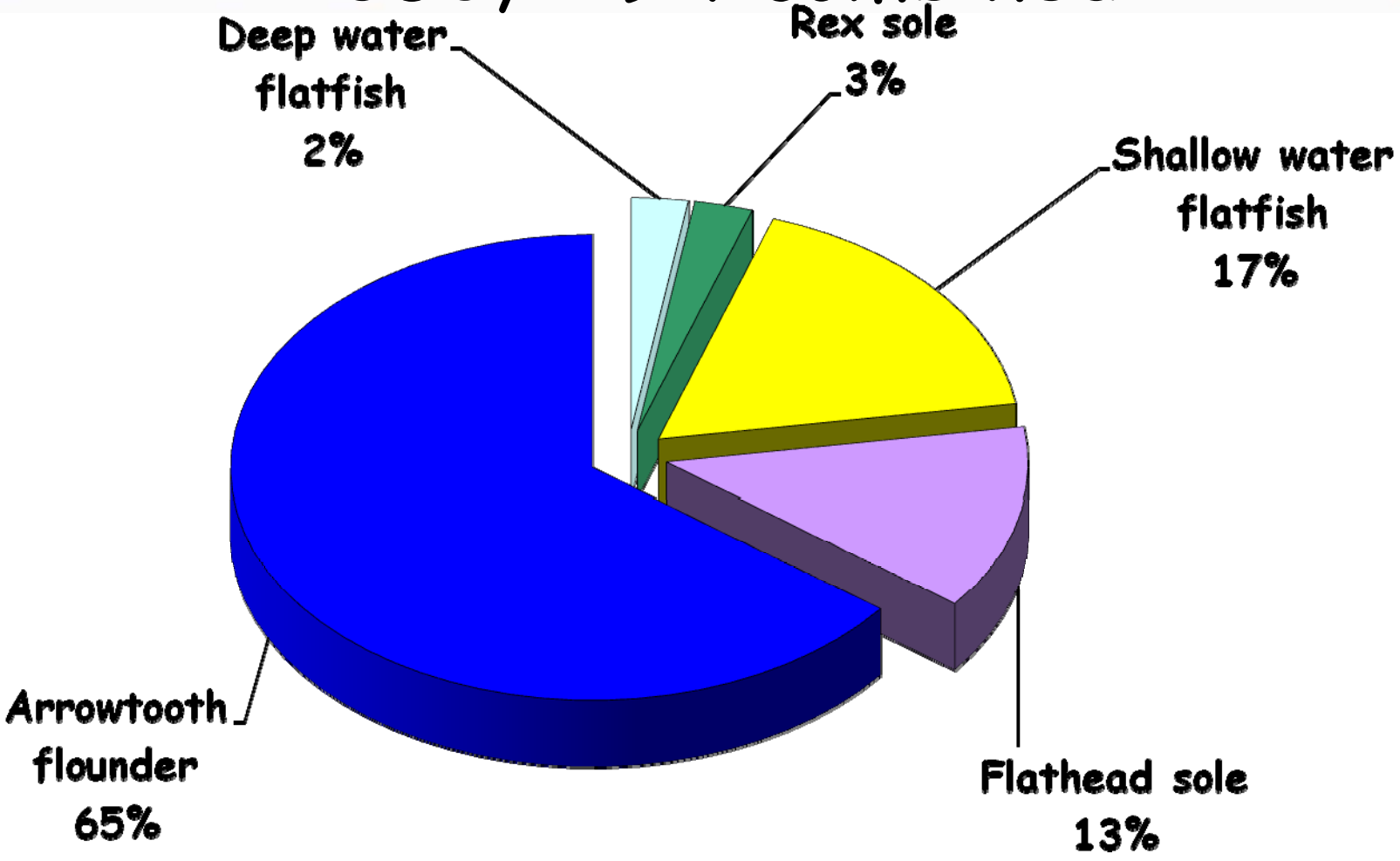
Species	2009 ABC	2010 ABC	Change	
Shallow water flatfish	60,989	56,242	down 4,747	(8%)
Deep water flatfish	9,168	6,190	down 2,978	(32%)
Rex sole	8,996	9,729	up 733	(8%)
Flathead sole	46,464	47,422	up 958	(2%)
Arrowtooth flounder	221,512	215,882	down 5,630	(3%)
Subtotal	347,129	335,465	down 11,664	(3%)

Deep-water ABC derived from Dover assessment (Tier 3) + others (Tier 6)

Shallow water flats: N and S rock sole Tier 4, others Tier 5

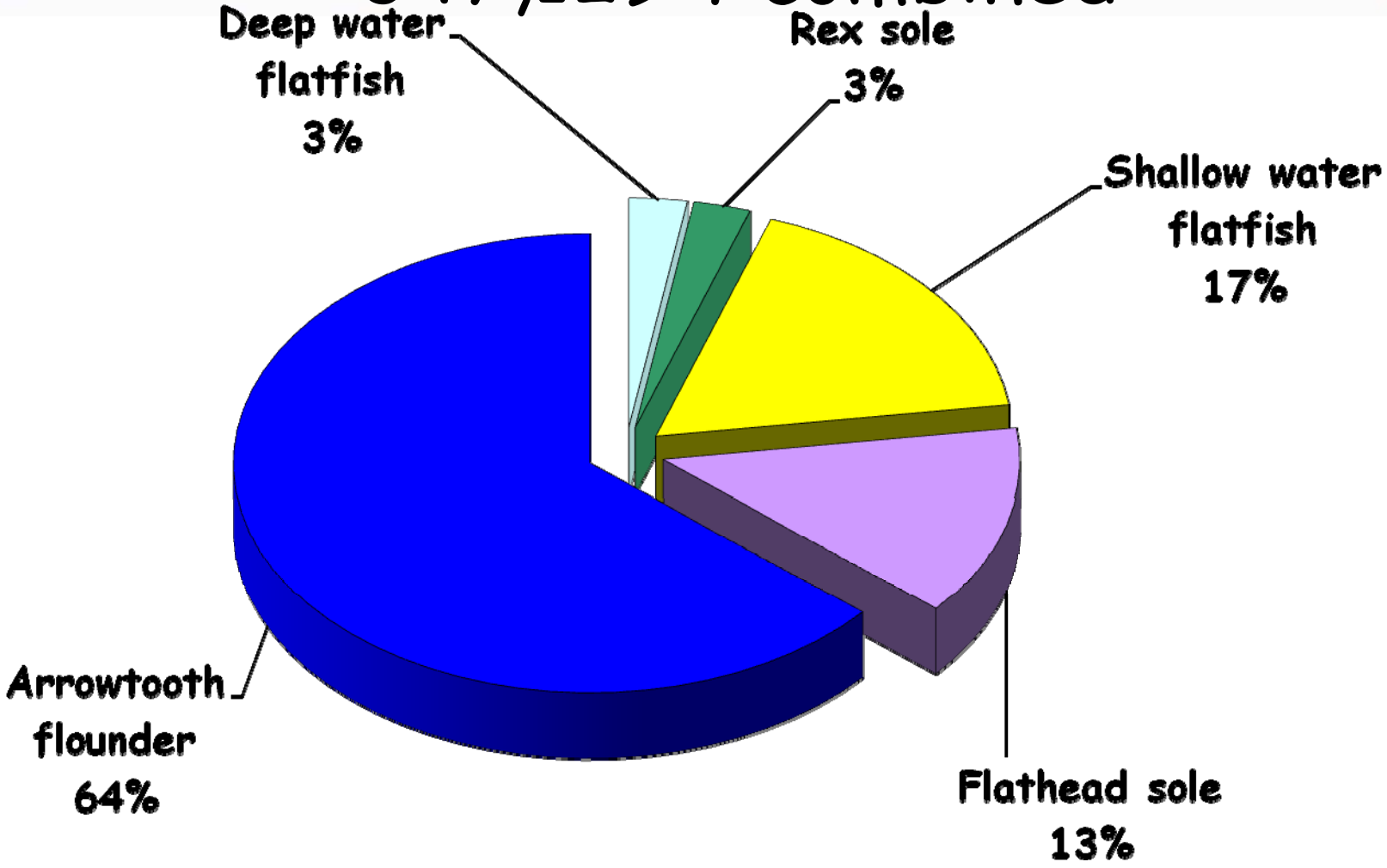
Flatfish 2008 ABC's

350,229 t combined



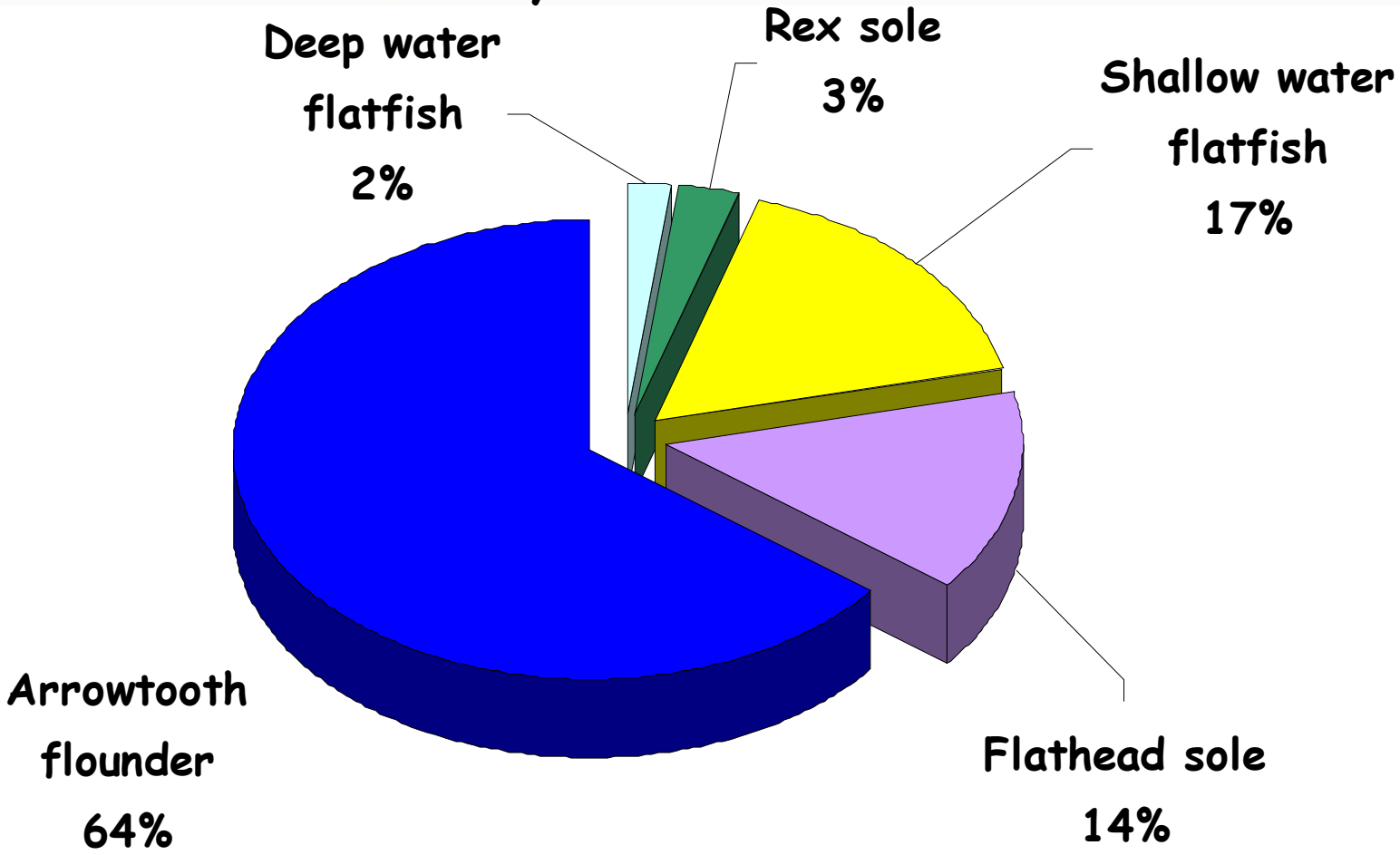
Flatfish 2009 ABC's

347,129 t combined



Flatfish 2010 ABC's

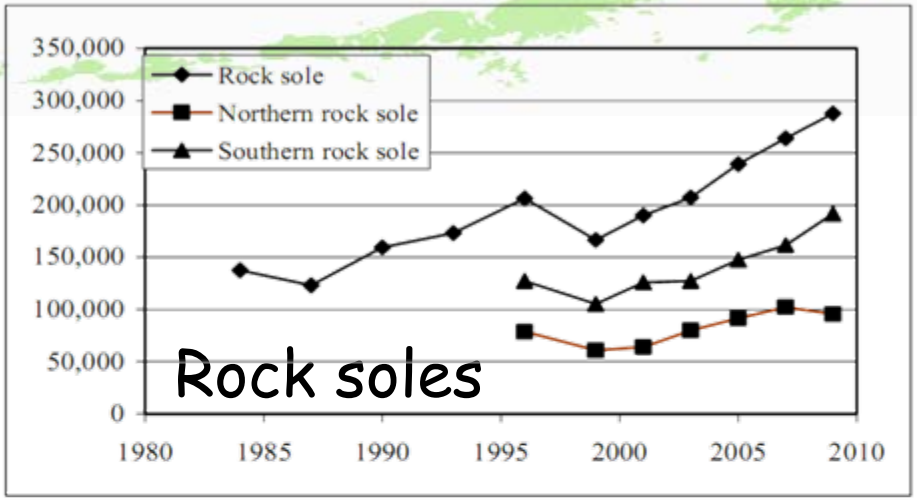
335,465 t combined

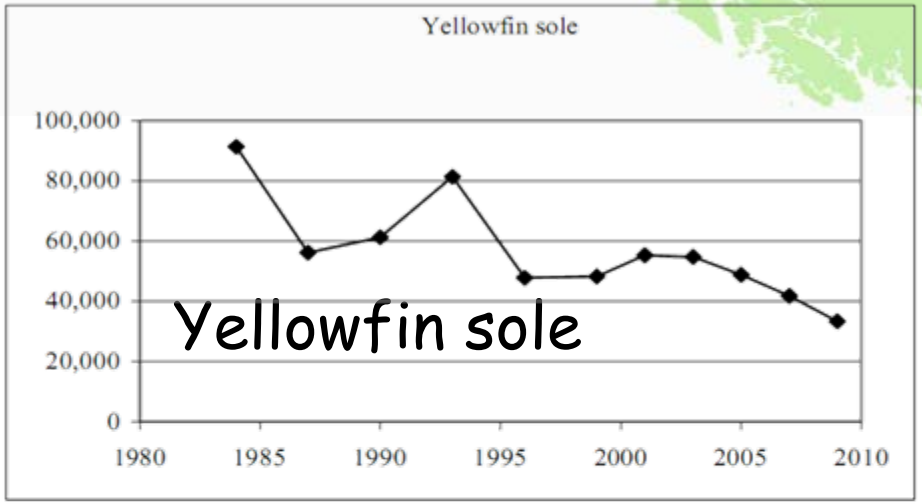


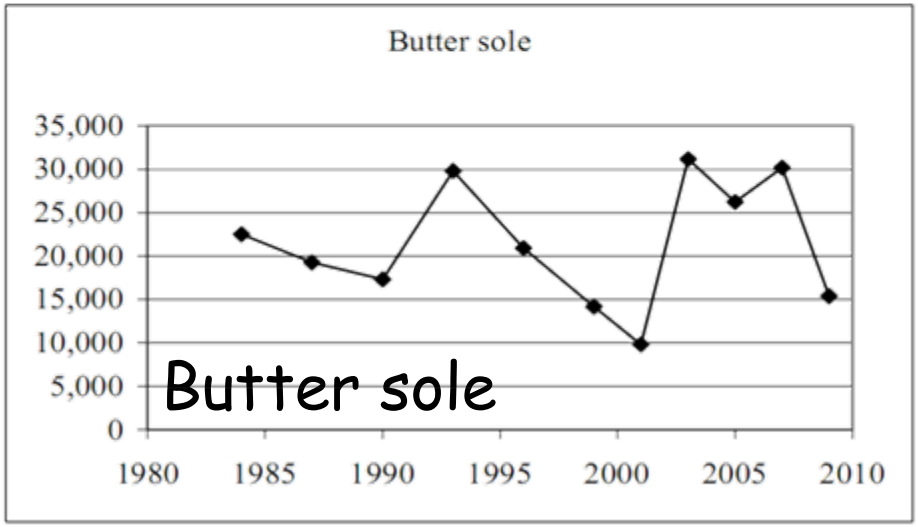
General comments on flatfish assessments

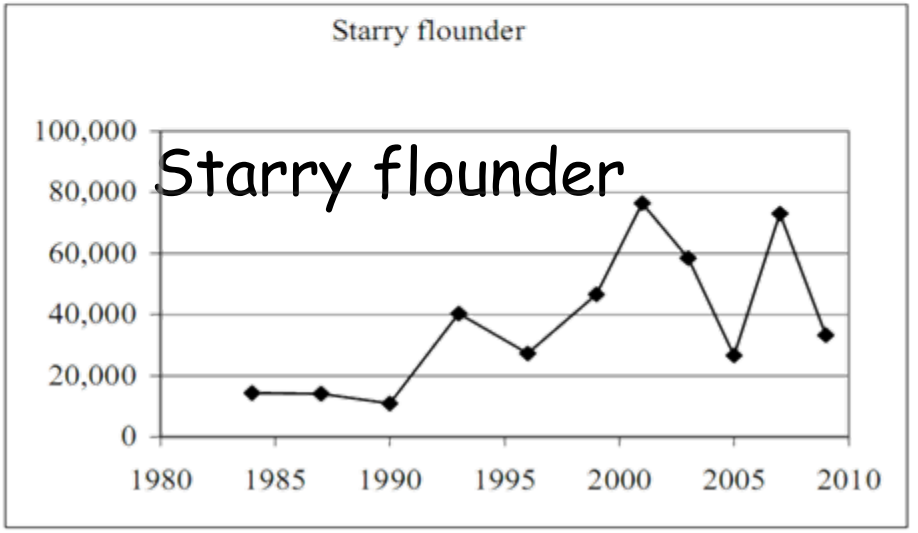
- **Full assessments presented**
- **Model developments continue**
- **All indications lightly exploited**

4. Shallow water flatfish









Summary: Page 21
Chapter: Page 465

4. Shallow water flatfish

Rely on survey

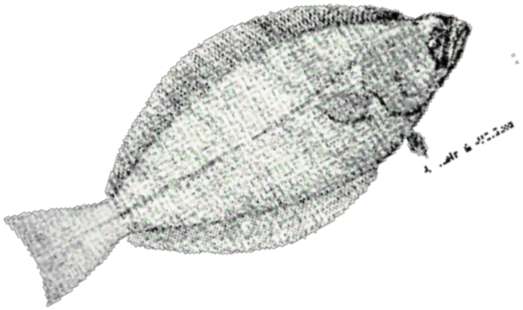
Decreased since 2007

Shallow water flatfish	Biomass	OFL	ABC
2010	398,961	67,768	56,242
2011		67,768	56,242

	ABC	OFL
Northern Rock sole	16,085	18,953
Southern Rock sole	26,064	30,460
Rock sole subtotal	42,149	49,413
Yellowfin sole	4,229	5,508
Butter sole	1,950	2,539
Starry flounder	4,210	5,483
English sole	2,363	3,078
Sand sole	355	463
Alaska plaice	986	1,284
Total	56,242	67,768

5. Deepwater flatfish

Dover sole
Deepsea sole
Greenland turbot



Dover sole: age-structured, two-sex model

- M estimated externally
- Survey catchability either
- Sex-specific fishery and survey selectivity

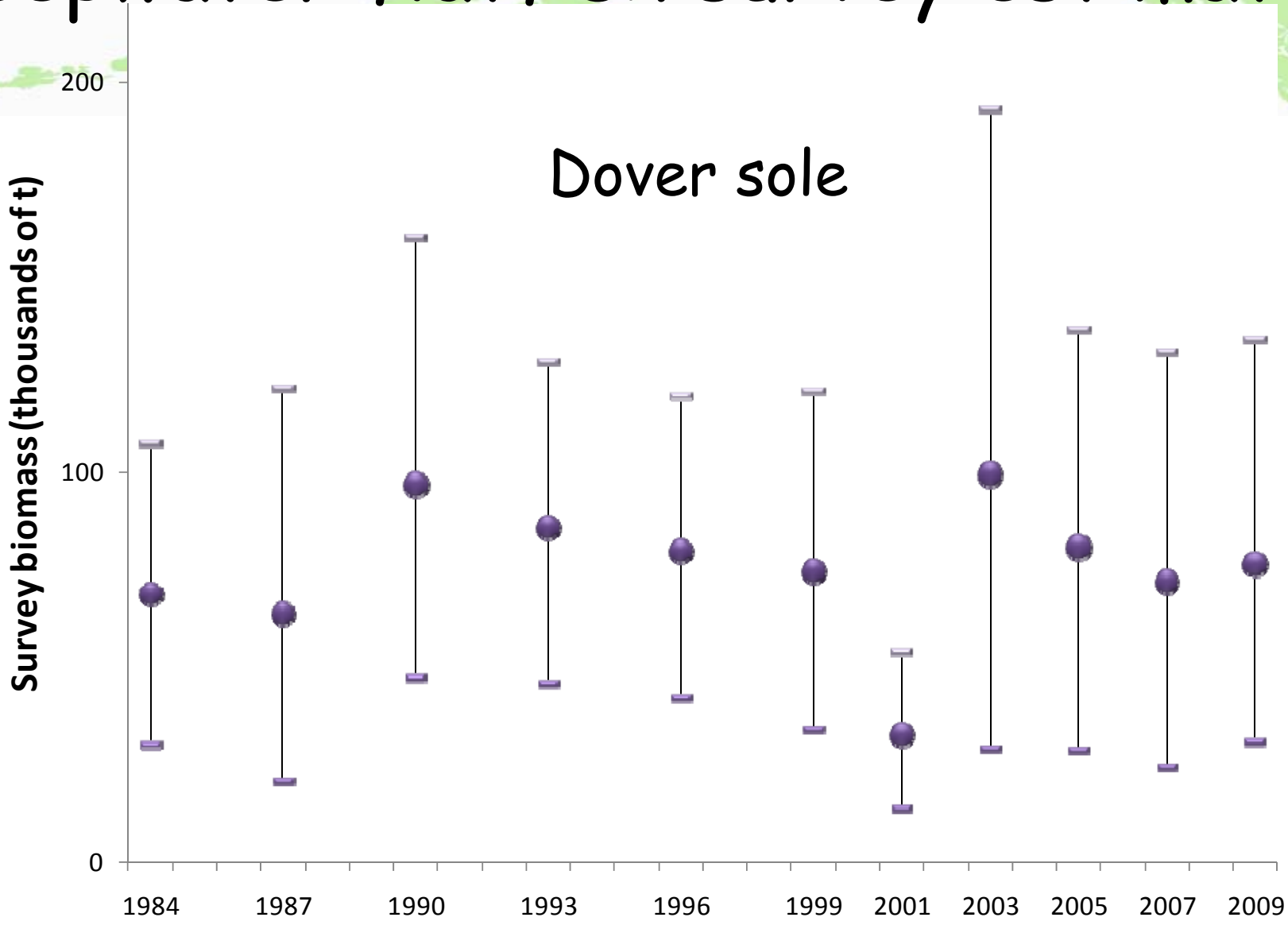
Tuned to

- Catch history, survey biomass
- Length compositions: fishery and survey
- Some survey age compositions

Summary: p. 22, Chapter: p. 495

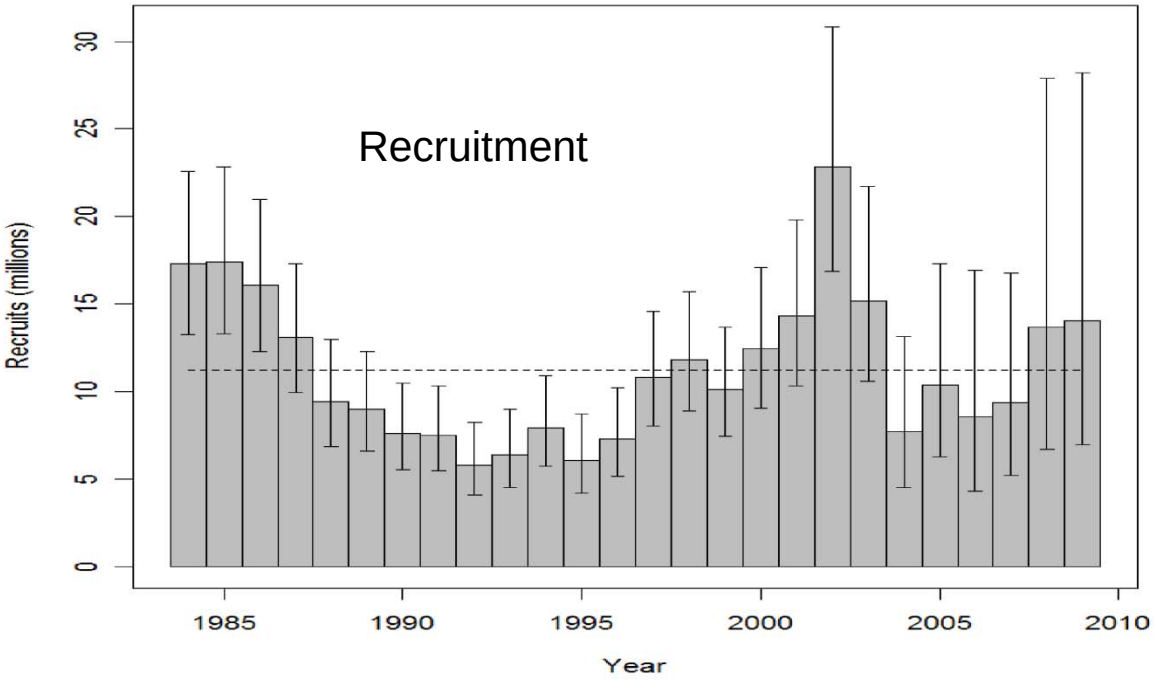
Fishery length compositions:	1991-2004
Survey length compositions:	1999, 2001, 2003, 2005, 2007, 2009
Survey age compositions:	1993, 1996, 1999, 2001, 2003, 2005, 2007

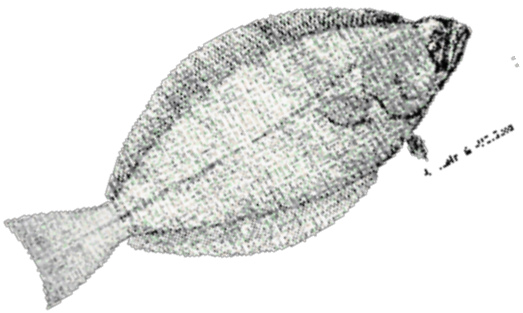
Deepwater flatfish survey estimates

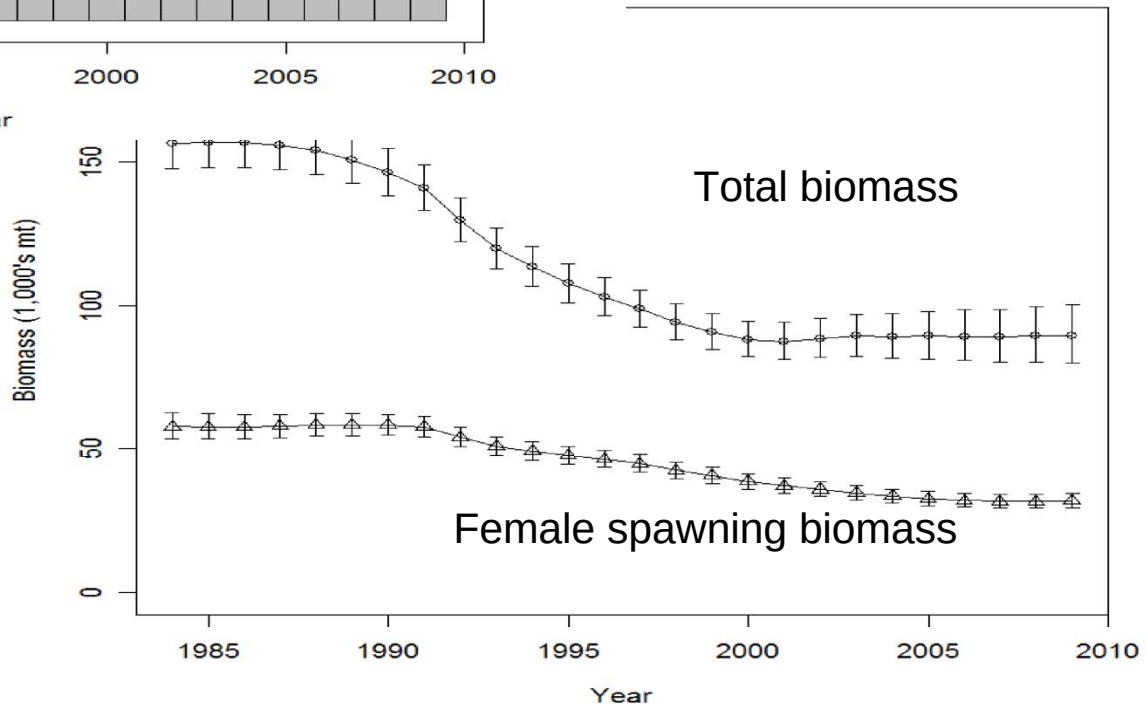


Deepsea sole + Greenland turbot average about 200 t of biomass

Dover sole results (deepwater flatfish)



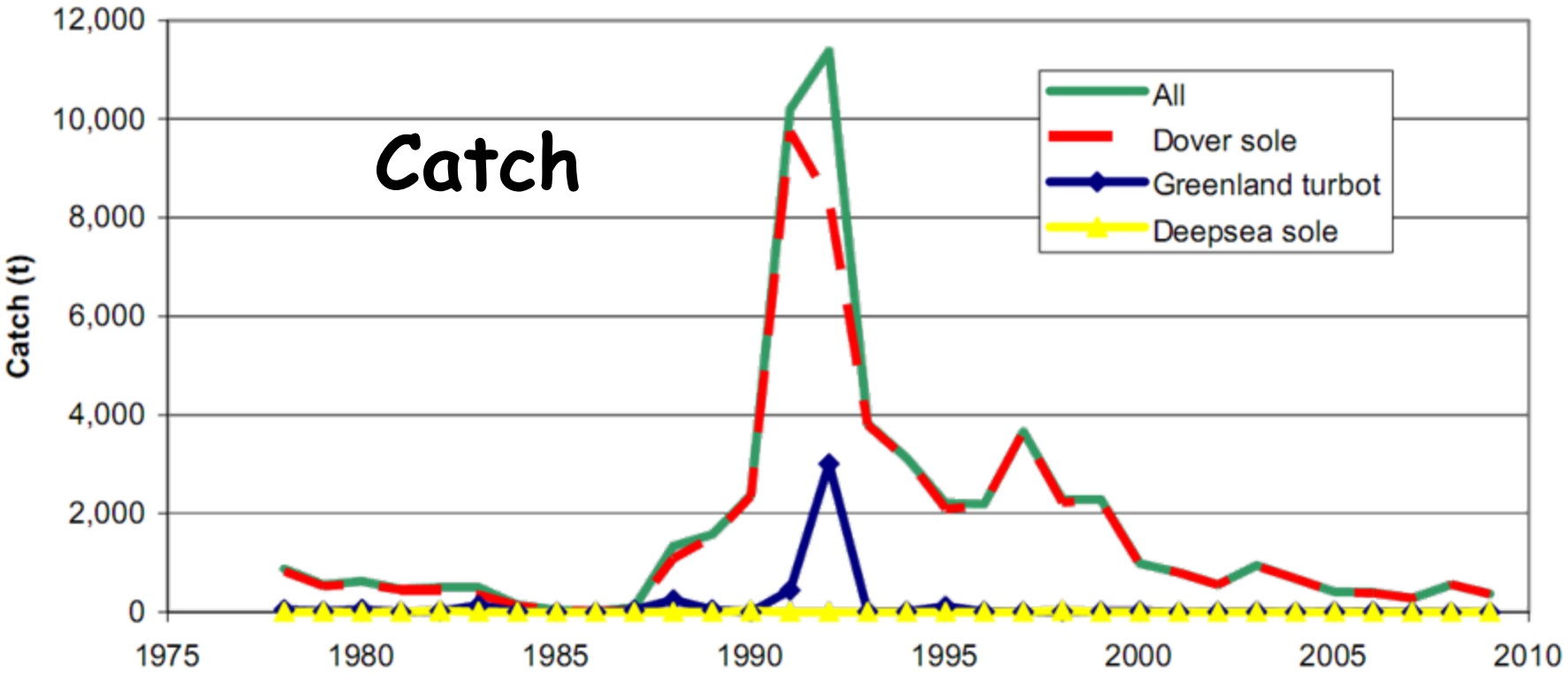




Deepwater flatfish

Dover sole
Deepsea sole
Greenland turbot

Deepwater flatfish	Biomass	OFL	ABC
2010	89,682	7,680	6,190
2011		7,847	6,325



6. GOA Rex Sole

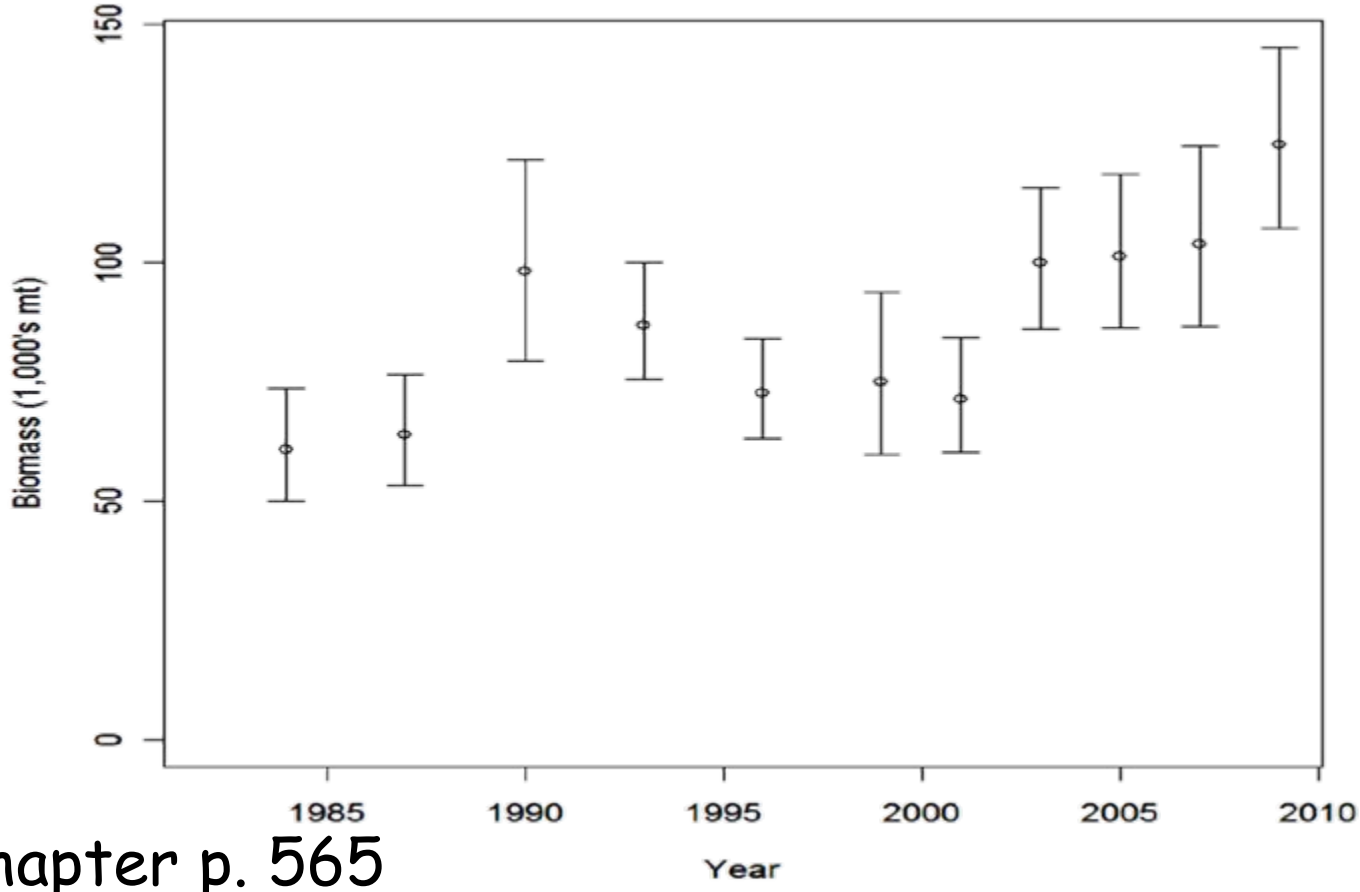
Age-structured model (since 2004), *M=0.17*

In 2005 adopted Tier 5 w/ model biomass

Maturity much younger than selectivity

2009 survey biomass highest observed

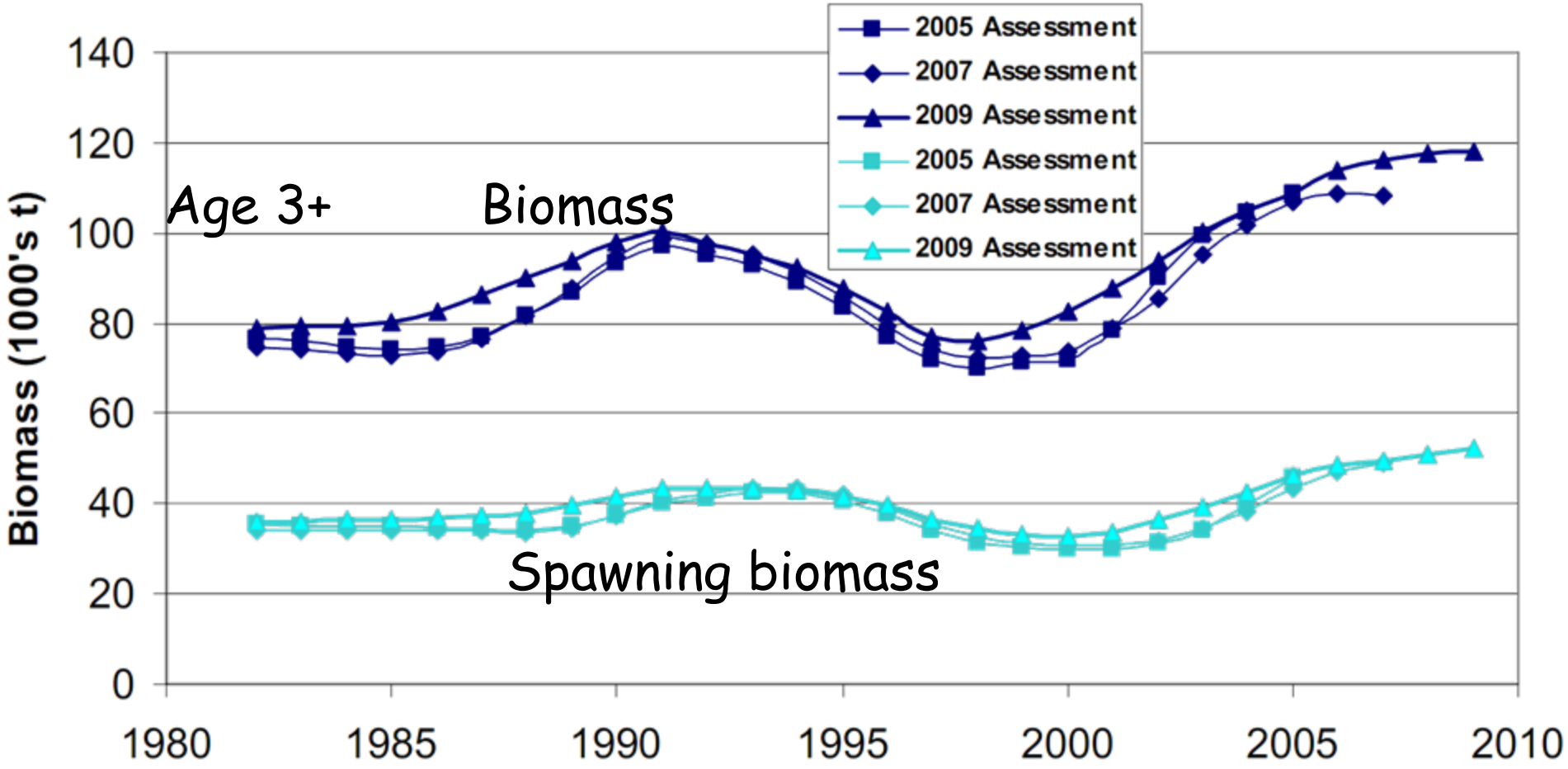
Up for MSC Certification together with rock soles, ATF, and flathead



Summary p. 23, Chapter p. 565

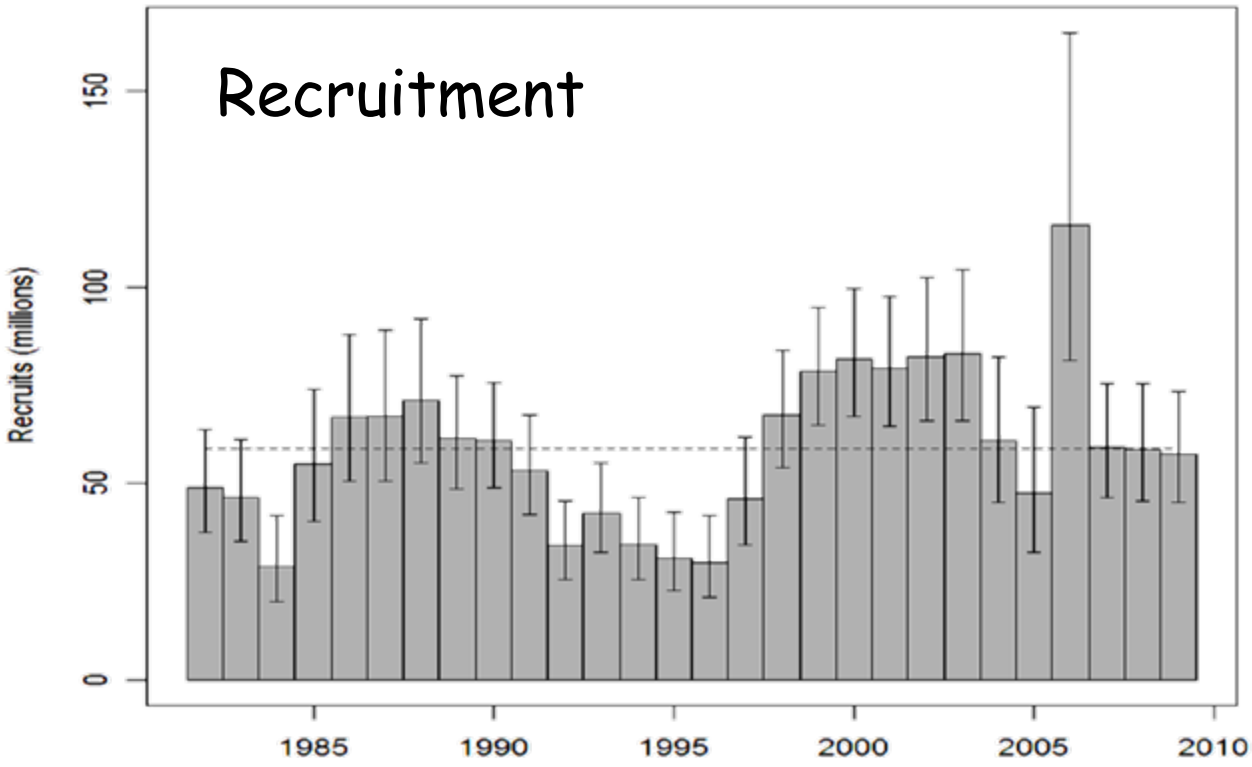
6. Rex sole

- **Retrospective**



6. Rex sole ABC/OFL

Rex sole	Biomass	OFL	ABC
2010	88,221	12,714	9,729
2011		12,534	9,592



Tier 5
(model based)

Key issue:

Selectivity estimate unreliable, hence $F_{40\%}$ also unreliable

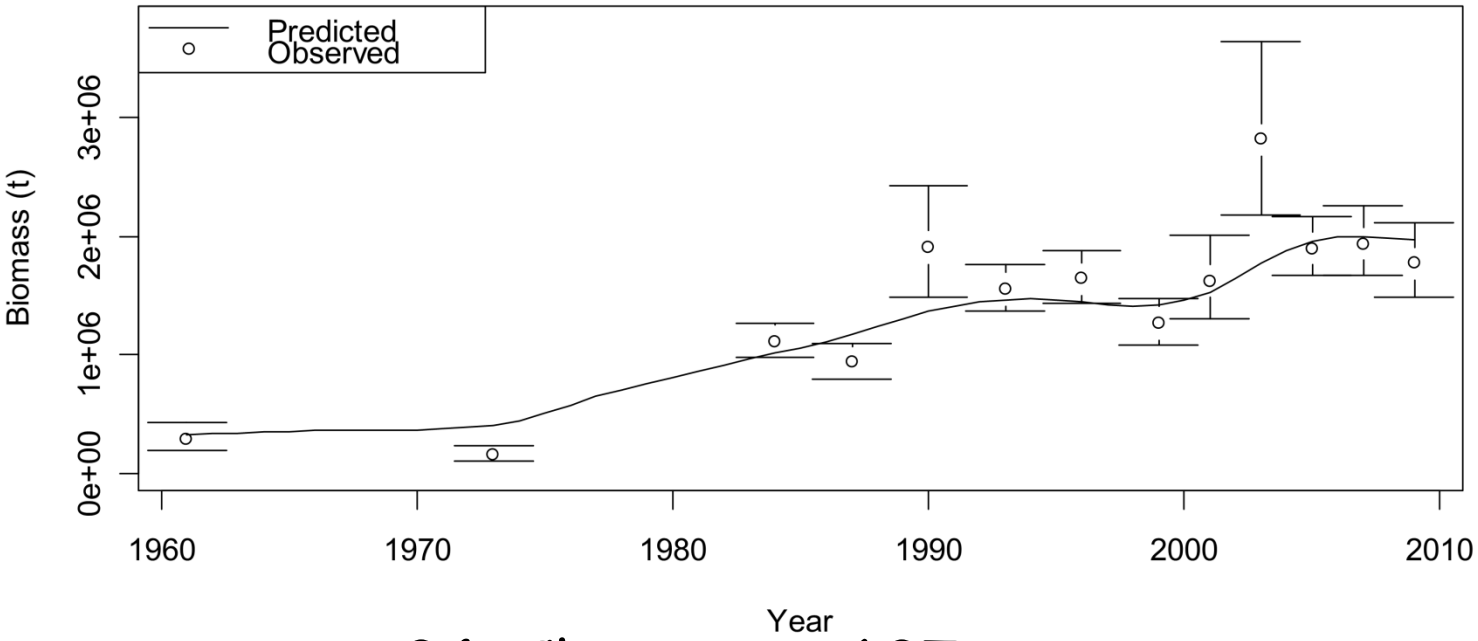
7. GOA Arrowtooth flounder

Based on age/sex structured model

2009 survey biomass and size composition

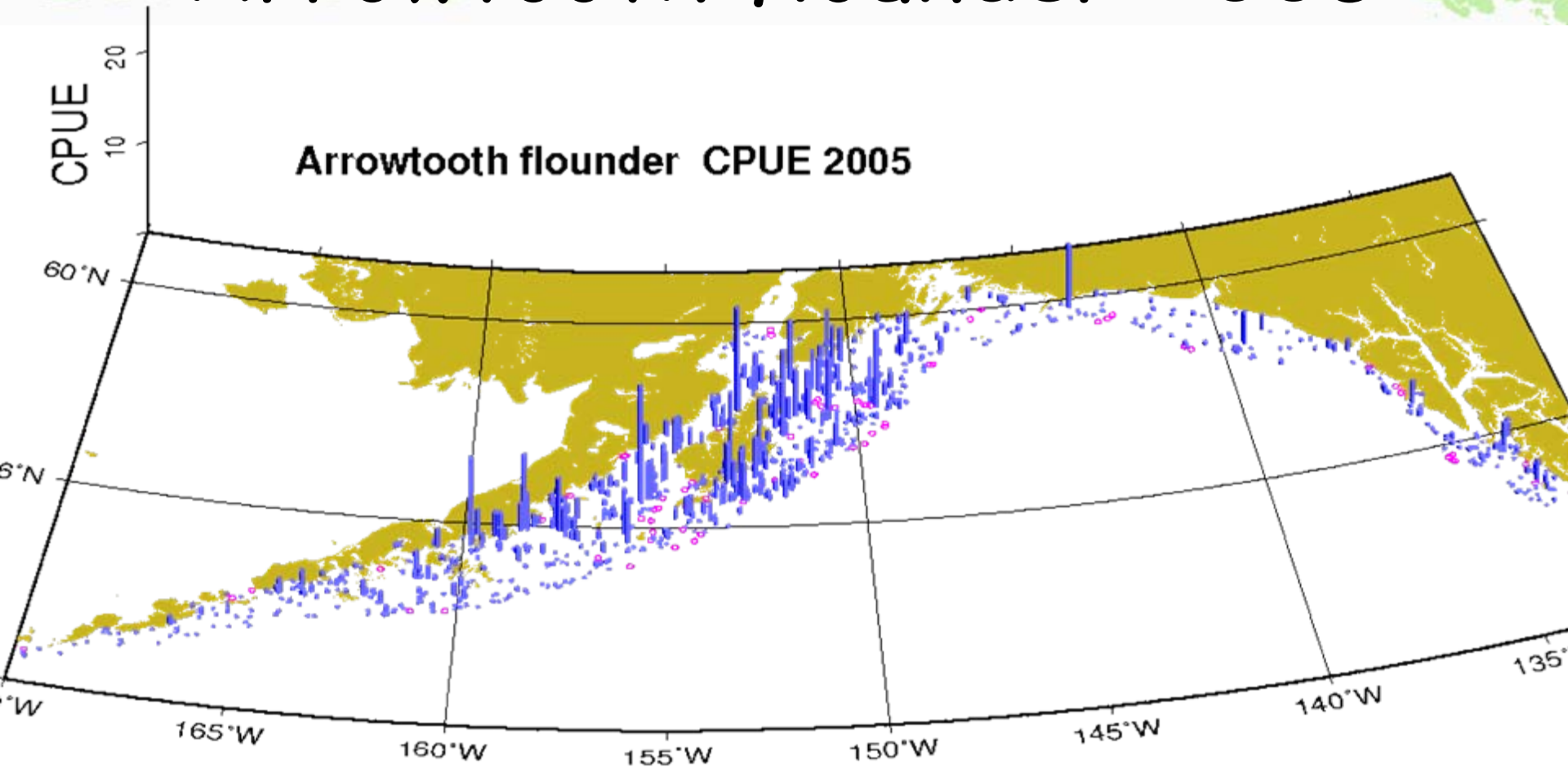
Age data from 2007 survey

Growth updated in 2007

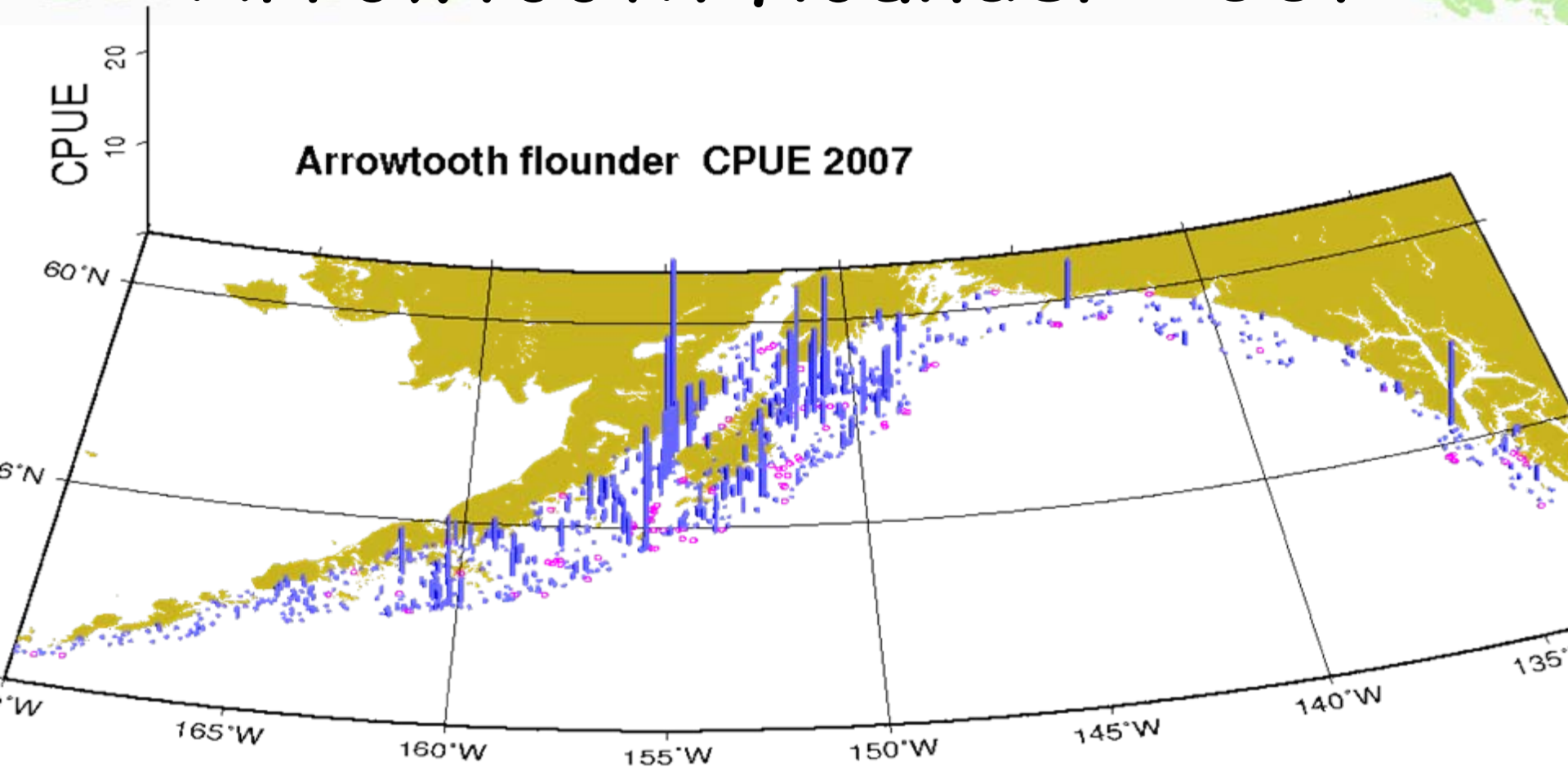


Summary p. 24, Chapter p. 627

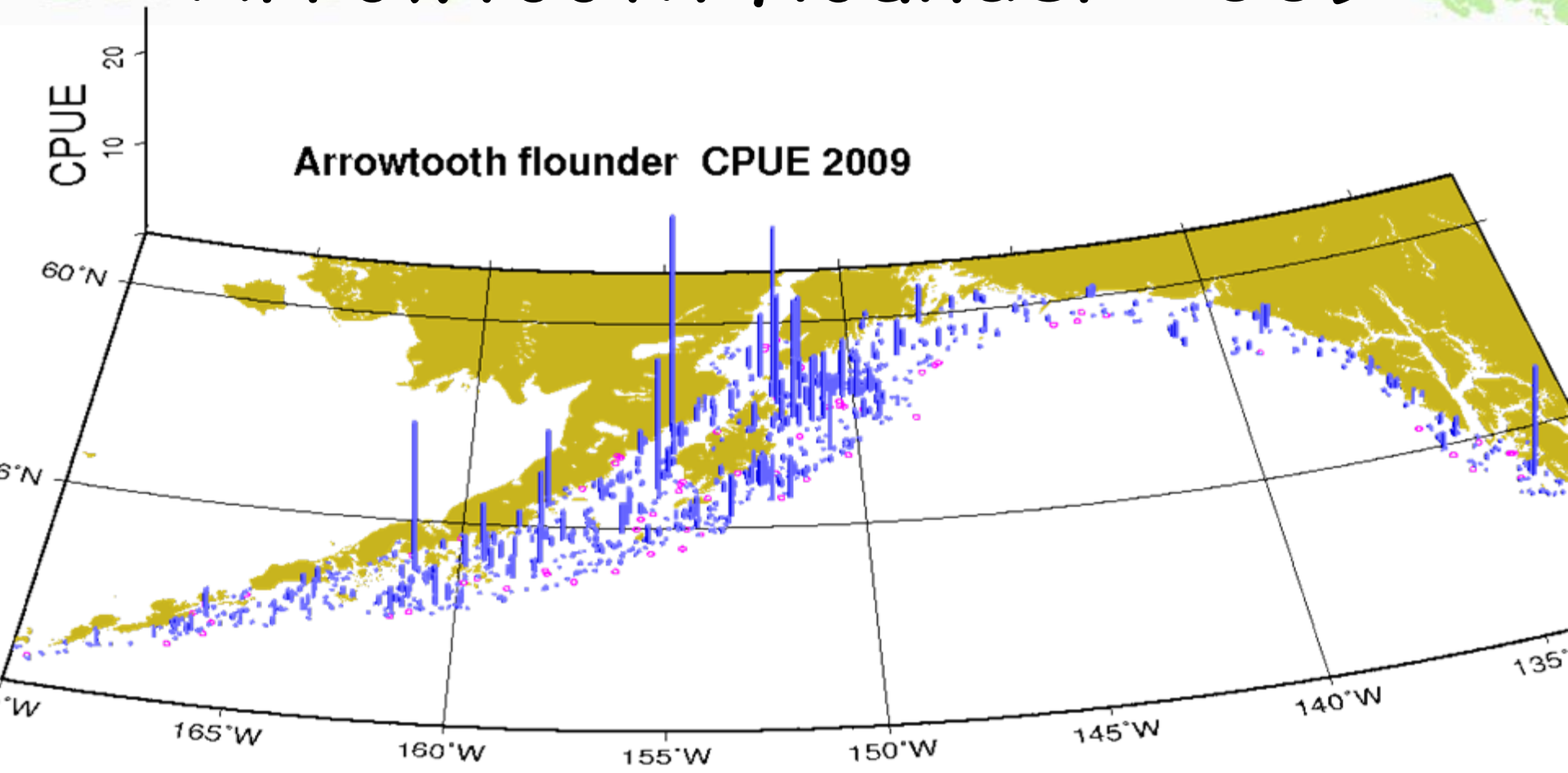
Arrowtooth flounder 2005



Arrowtooth flounder 2007



Arrowtooth flounder 2009

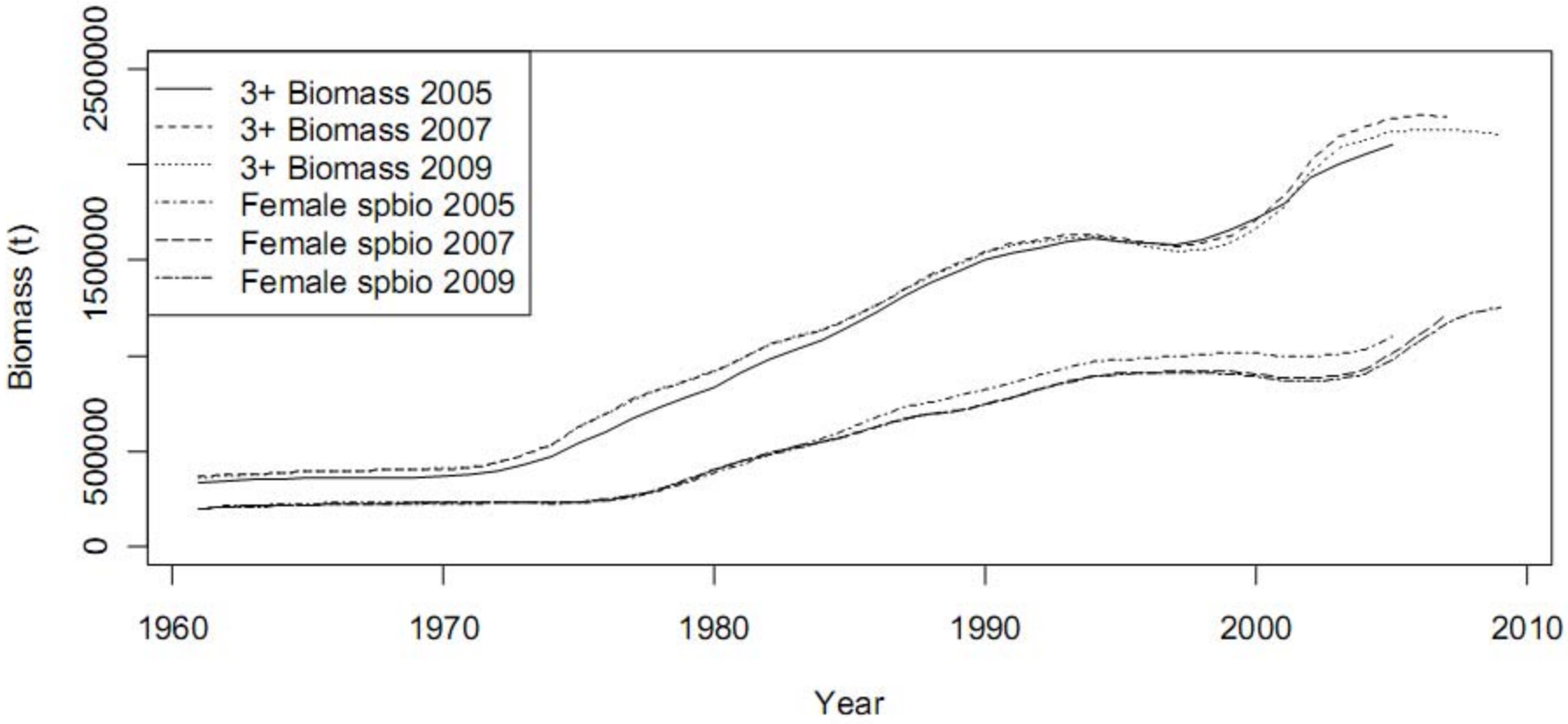


GOA Arrowtooth flounder ABC/OFL

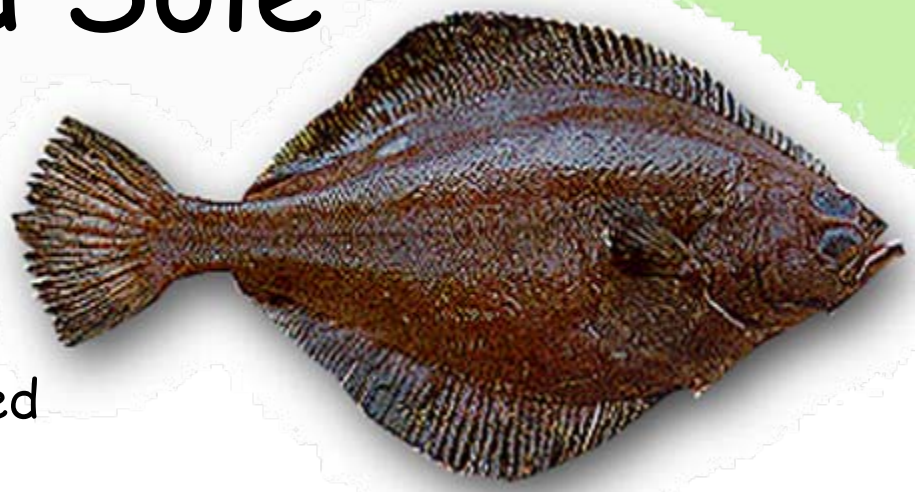
Tier 3a

2010 ABC down slightly as predicted from 2008 biomass trend

Year	Female spawning Biomass	OFL	ABC
2010	2,139,000	254,271	215,882
2011		250,559	212,719

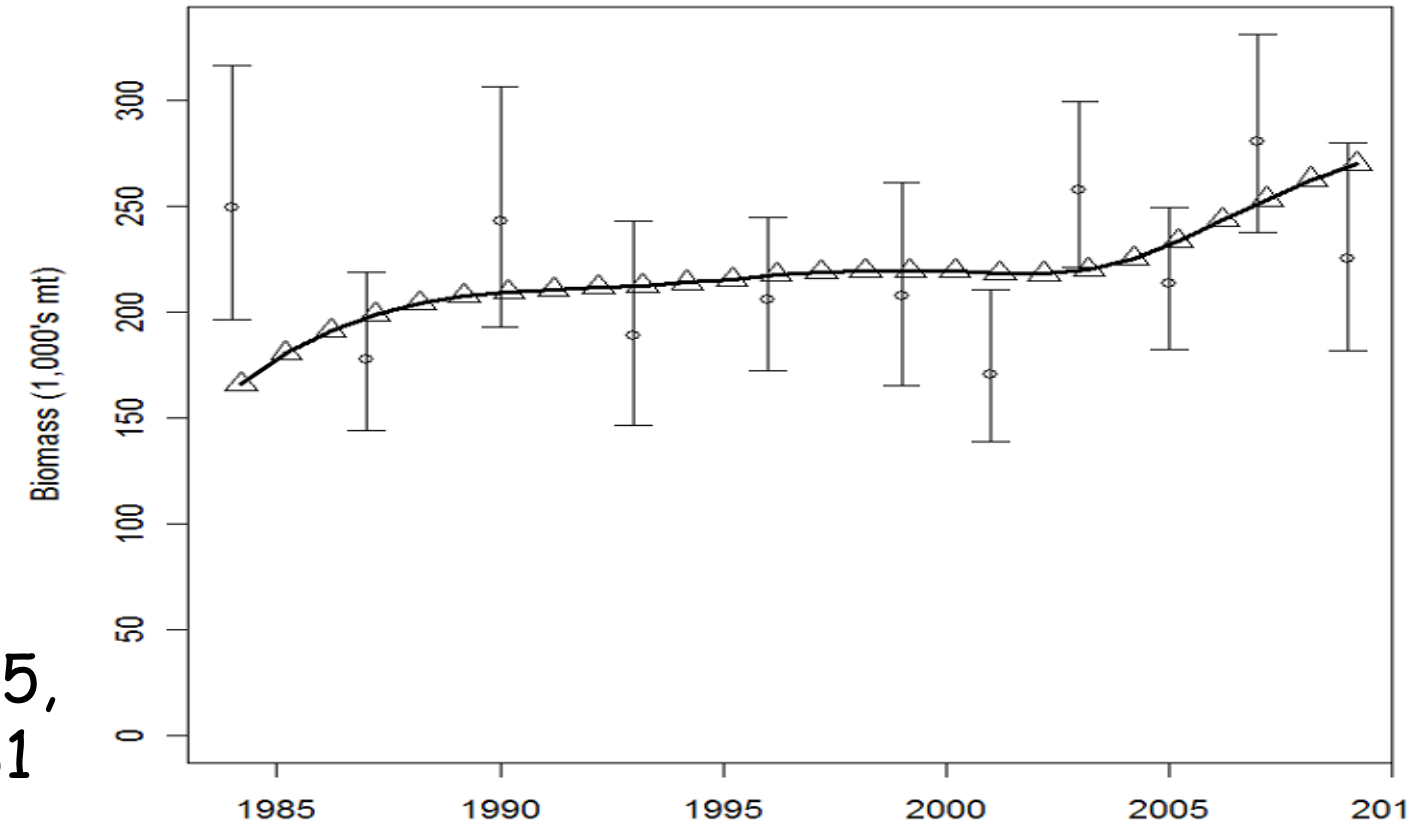


8. GOA Flathead Sole



Age-structured model

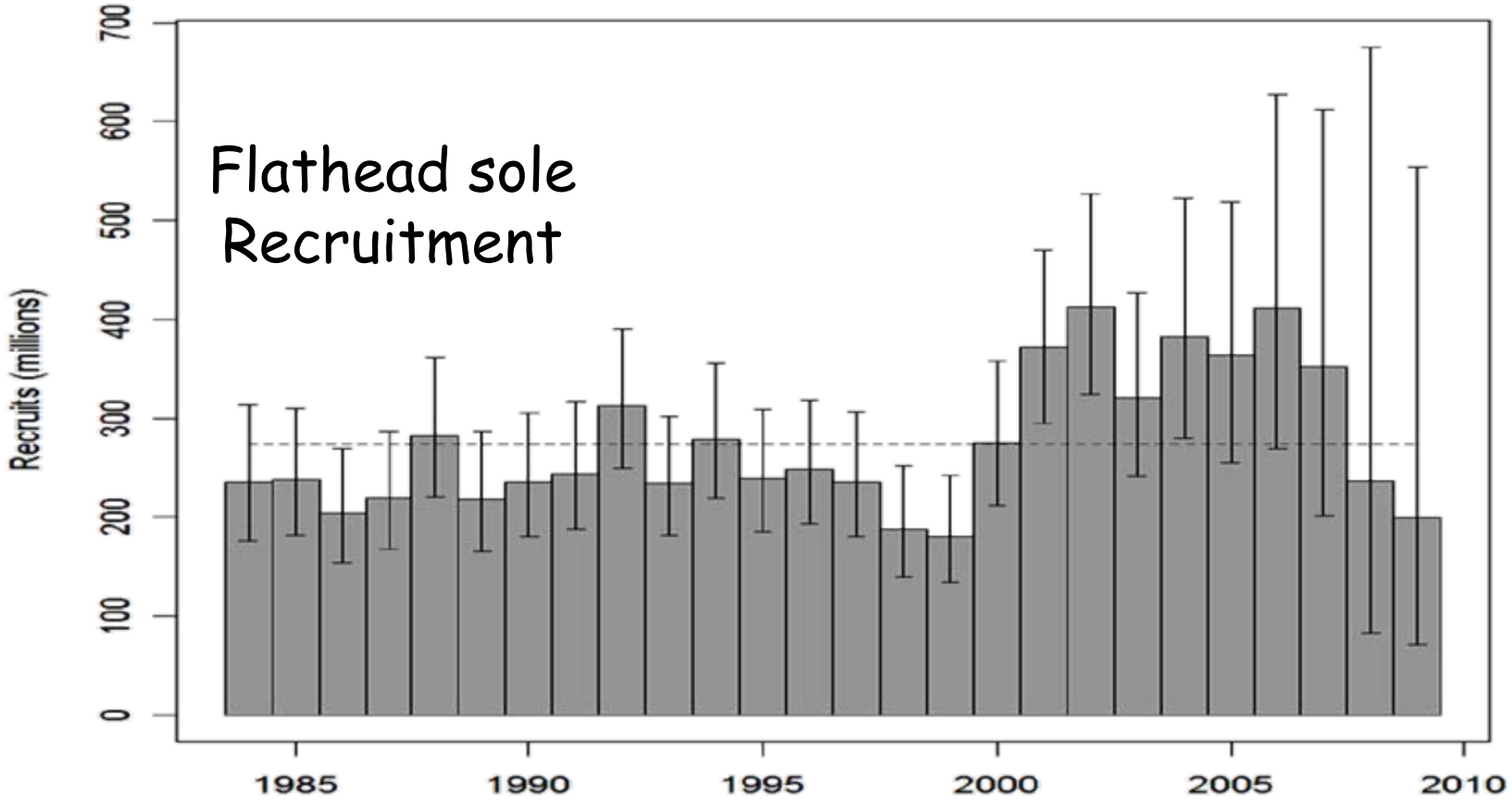
- 2007 survey biomass highest observed
- 2009 closer to mean



Summary p. 25,
Chapter p. 681

Flathead sole ABC/OFL

	Biomass	OFL	ABC
2010	328,862	59,295	47,422
2011		61,601	49,286

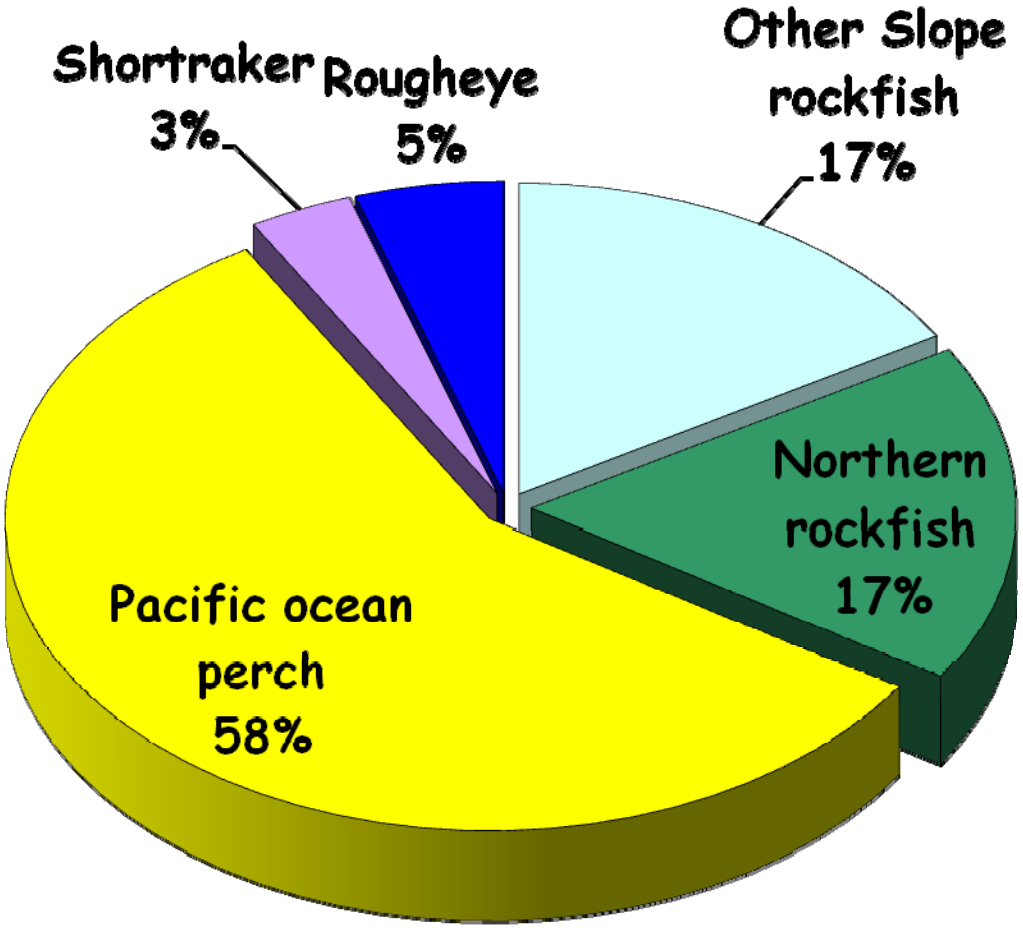


Rockfish

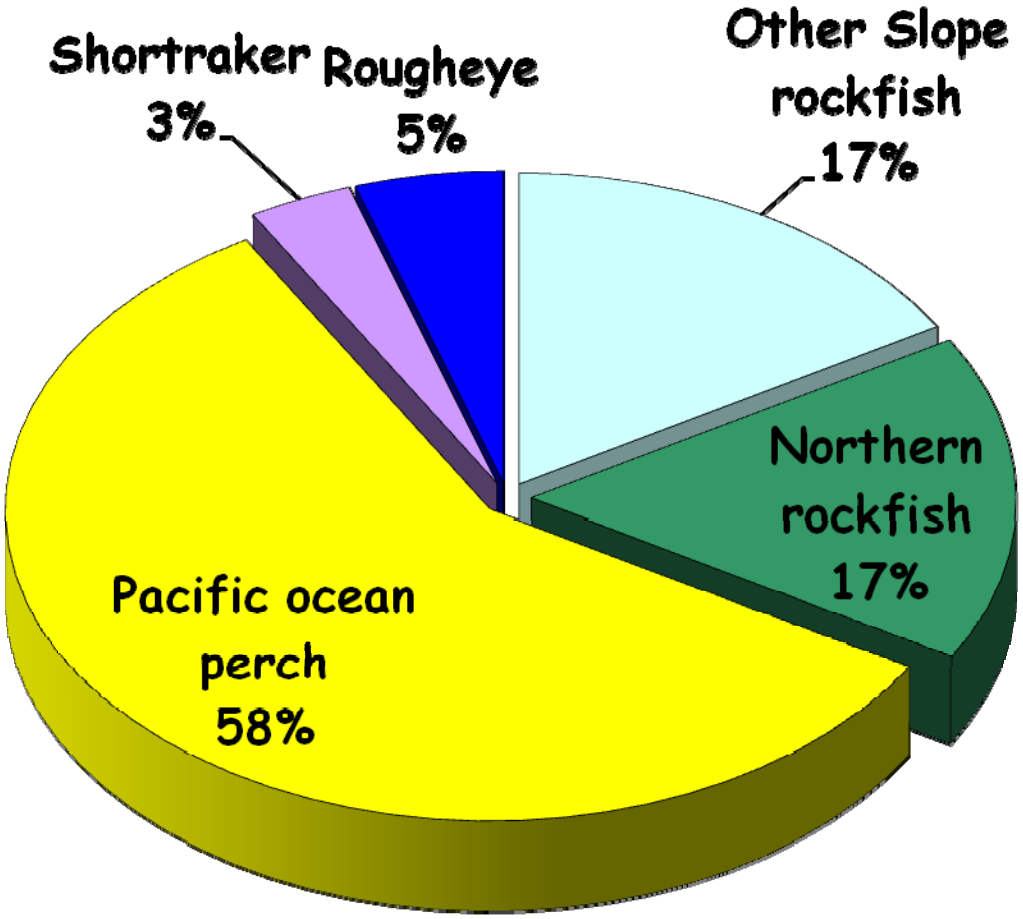
Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

Summary: Page 27
Chapter: Page 743

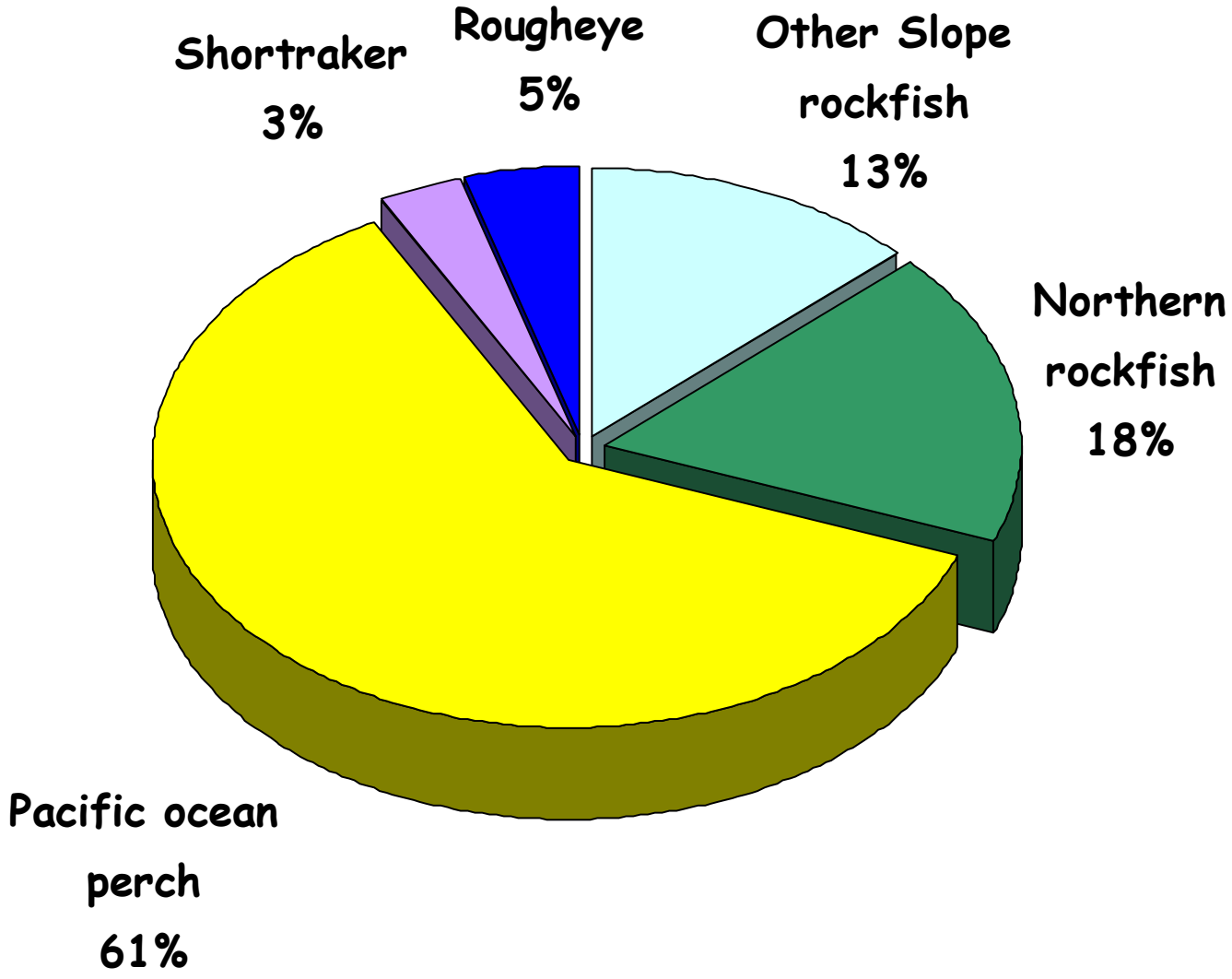
Slope Rockfish 2008 ABC's 26,029 tons total



Slope Rockfish 2009 ABC's 25,952 tons total



Slope Rockfish 2010 ABC's 28,649 tons total



POP ABC Summary

Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

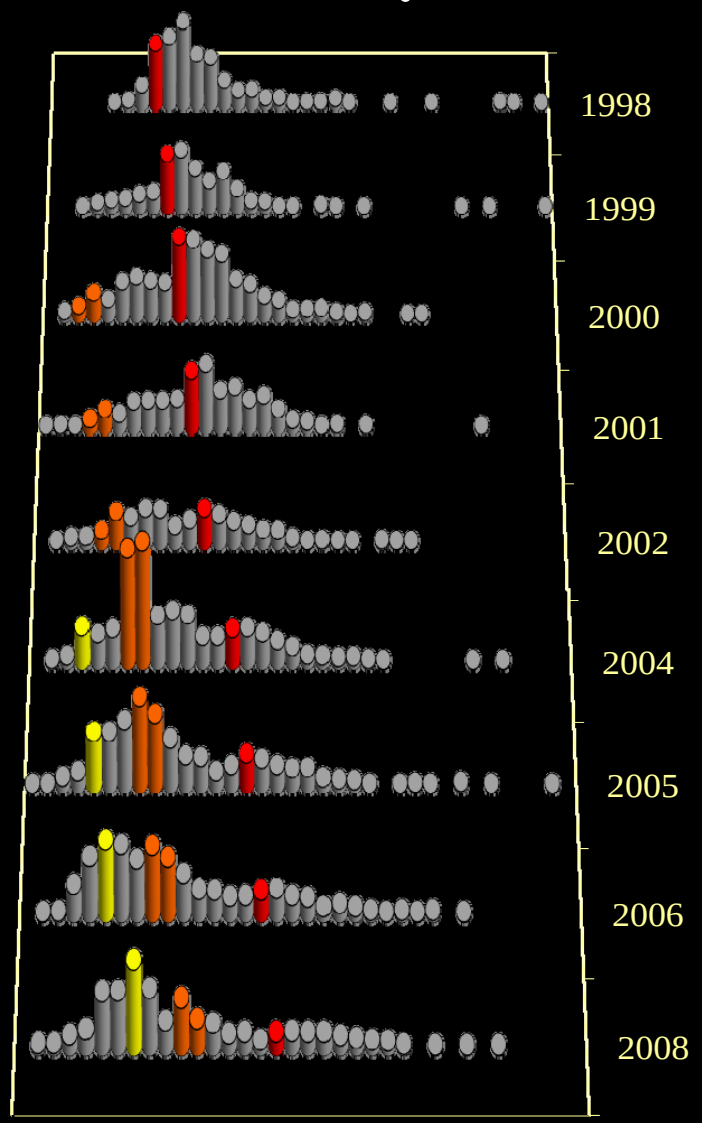
9. Pacific ocean perch

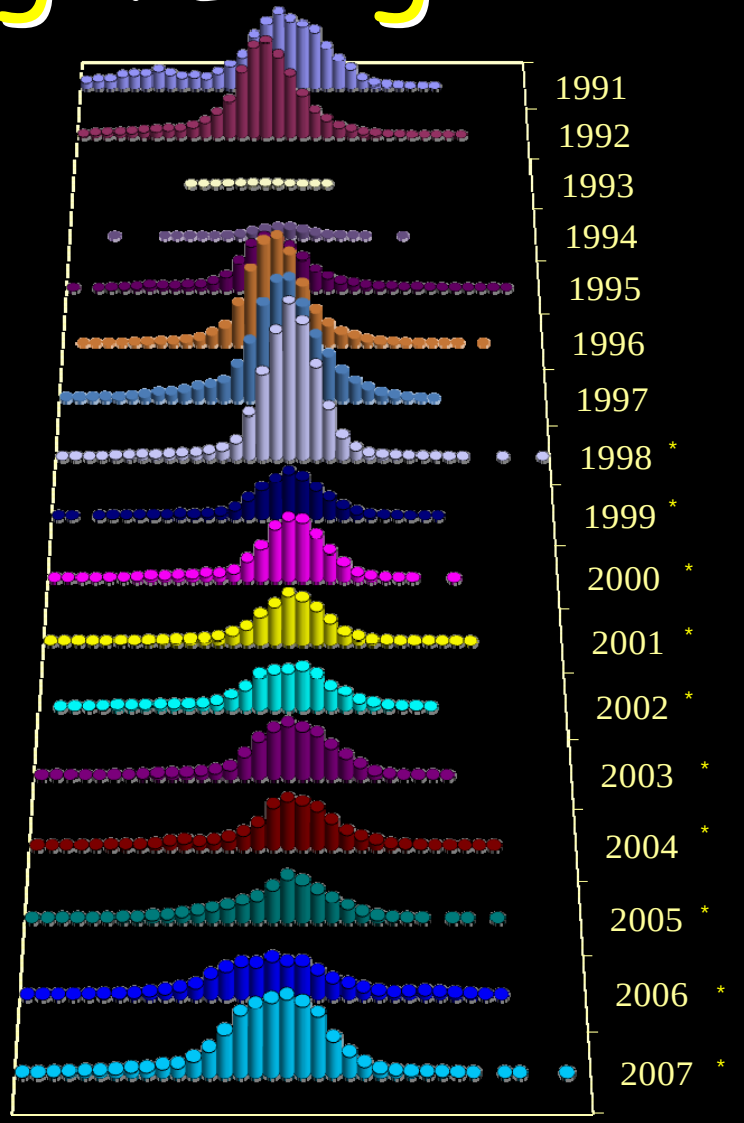
- **Issues:**
  - Survey catchability (q) estimates unstable
  - Fishery selectivity domed
    - But constrained
  - *q* and selectivity interact
  - Re-evaluate dome-shape selectivity in fishery

Summary: Page 28
Chapter: Page 743

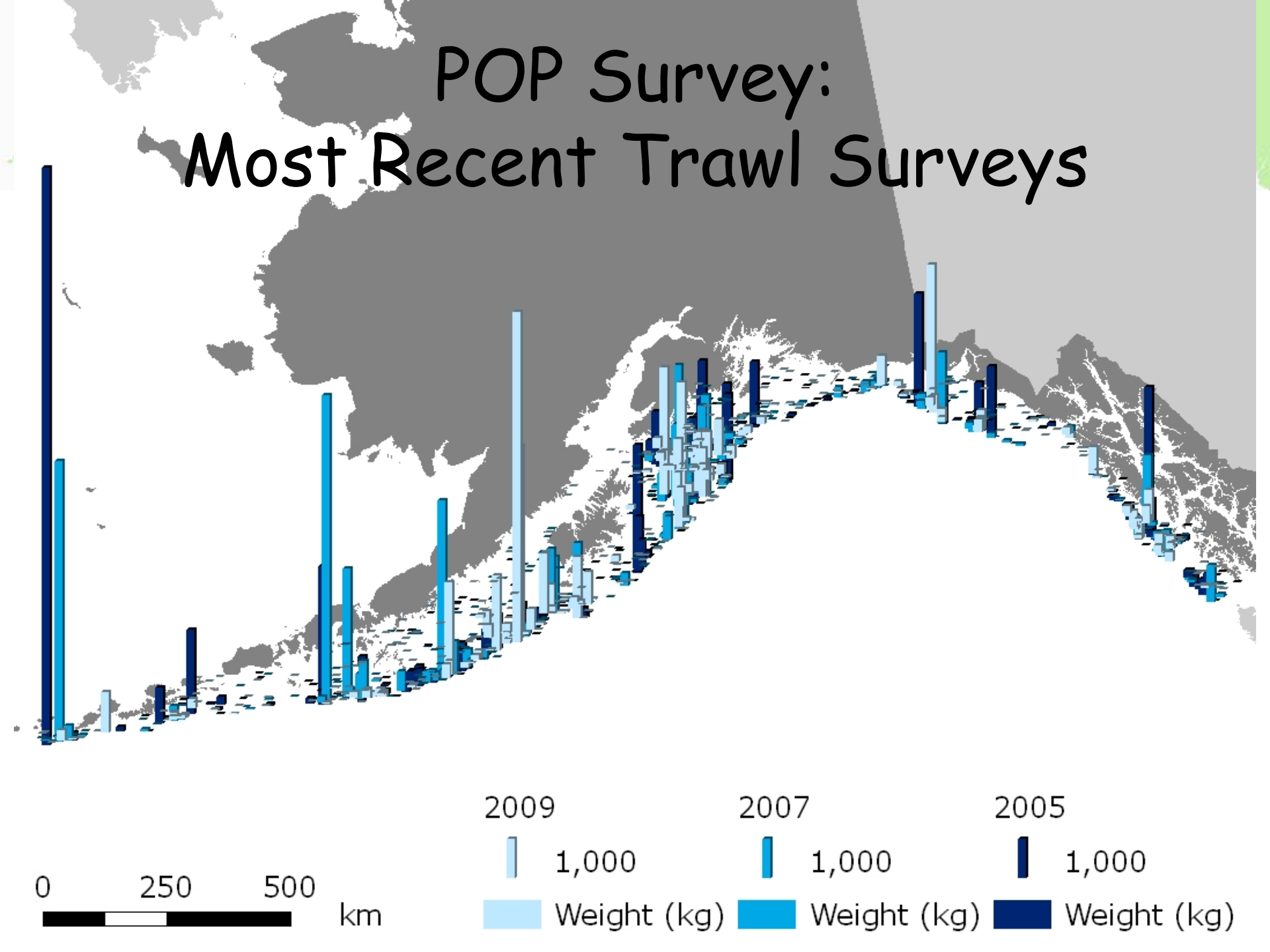
* Not used in model

POP - Fishery Age/Length





POP Survey:
Most Recent Trawl Surveys



POP – Model Evaluation

Changes in assessment methods

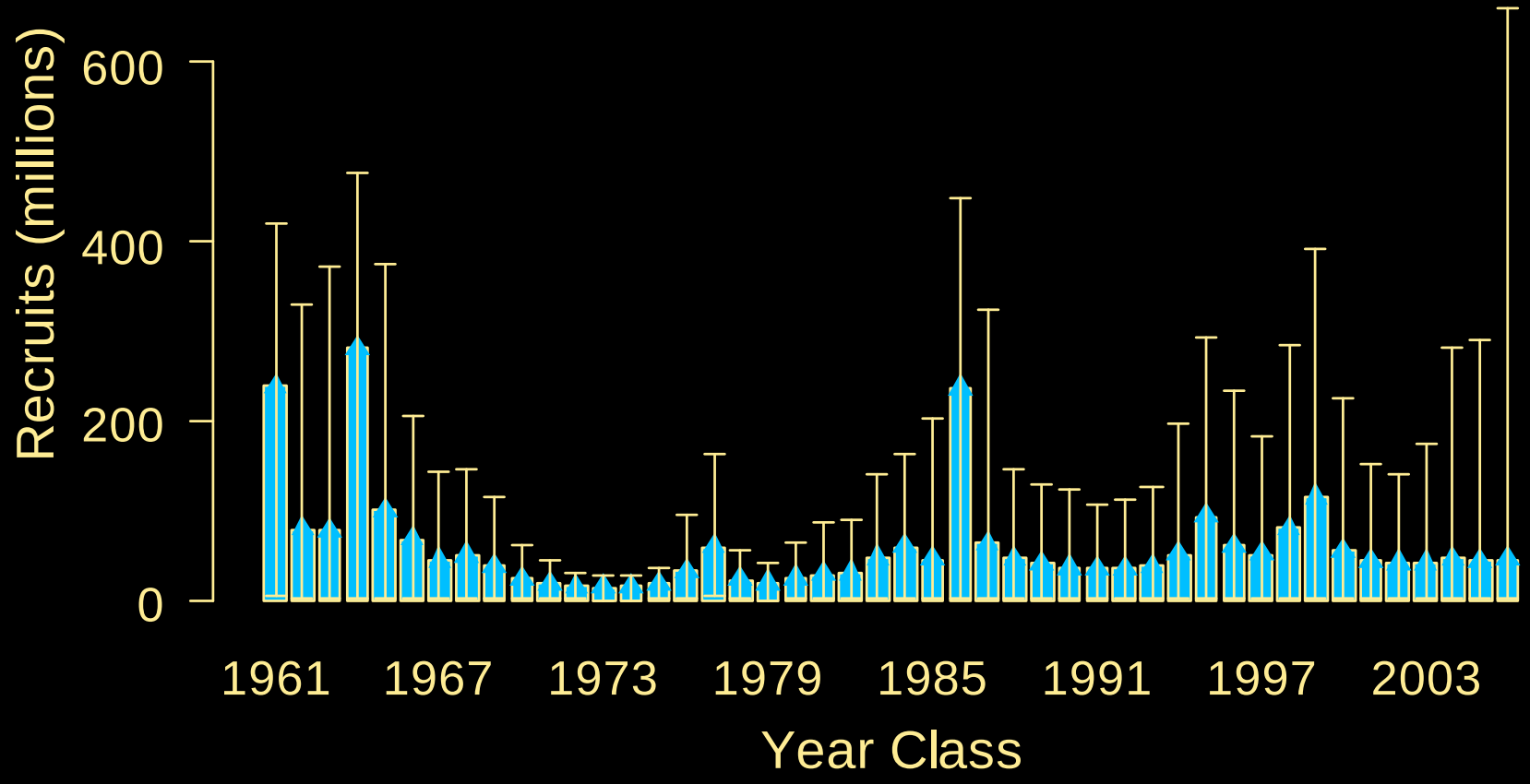
Appended old, updated, and new

New selectivity functions to describe fishing fleet

Fit toward dome in three stages

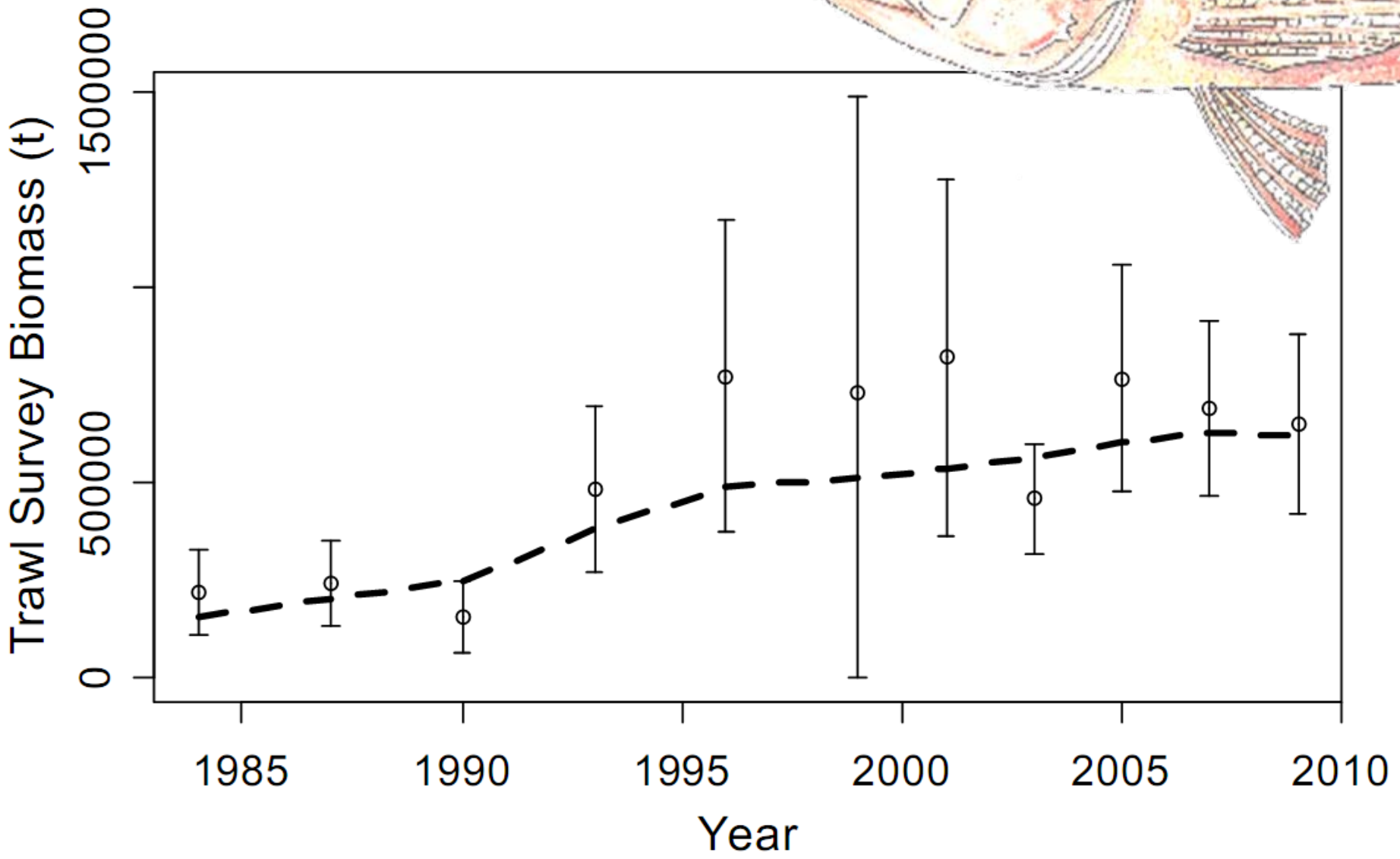
- 1961 to 1976: the beginning and end of the foreign fishing fleets massive catches
- 1977 to 1995: Domestic fishery
  - large factory trawlers still dominant
- 1996-Present: The emergence of catcher-boats, semi-pelagic trawling, fishing cooperatives, fishing shallower

POP recruitment

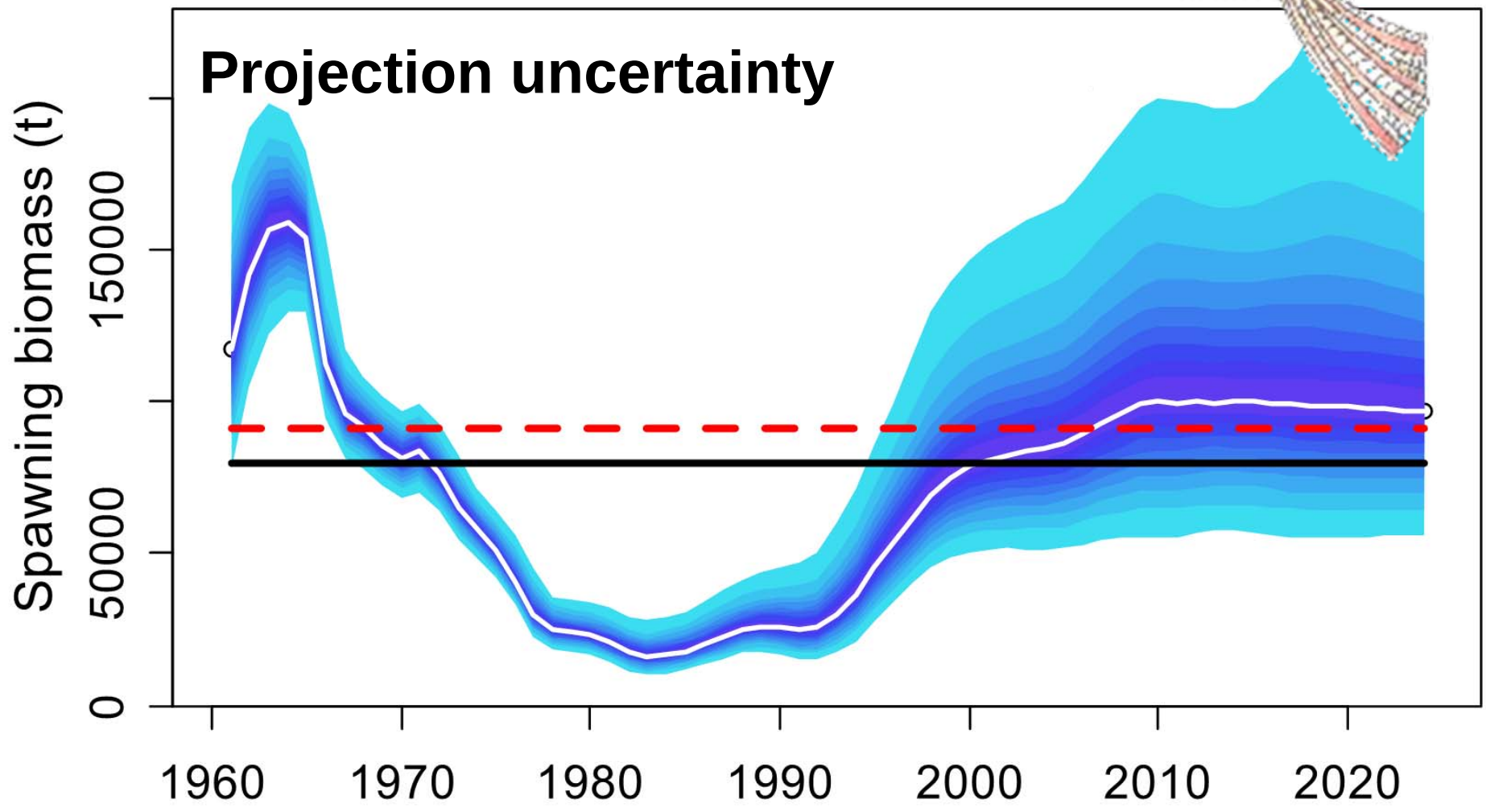


Gulf of Alaska

Pacific ocean perch biomass estimates



Pacific ocean perch female spawning biomass



Pacific ocean perch ABC/OFL

	Biomass	OFL	ABC
2010	334,797	20,243	17,584
2011		19,560	16,993

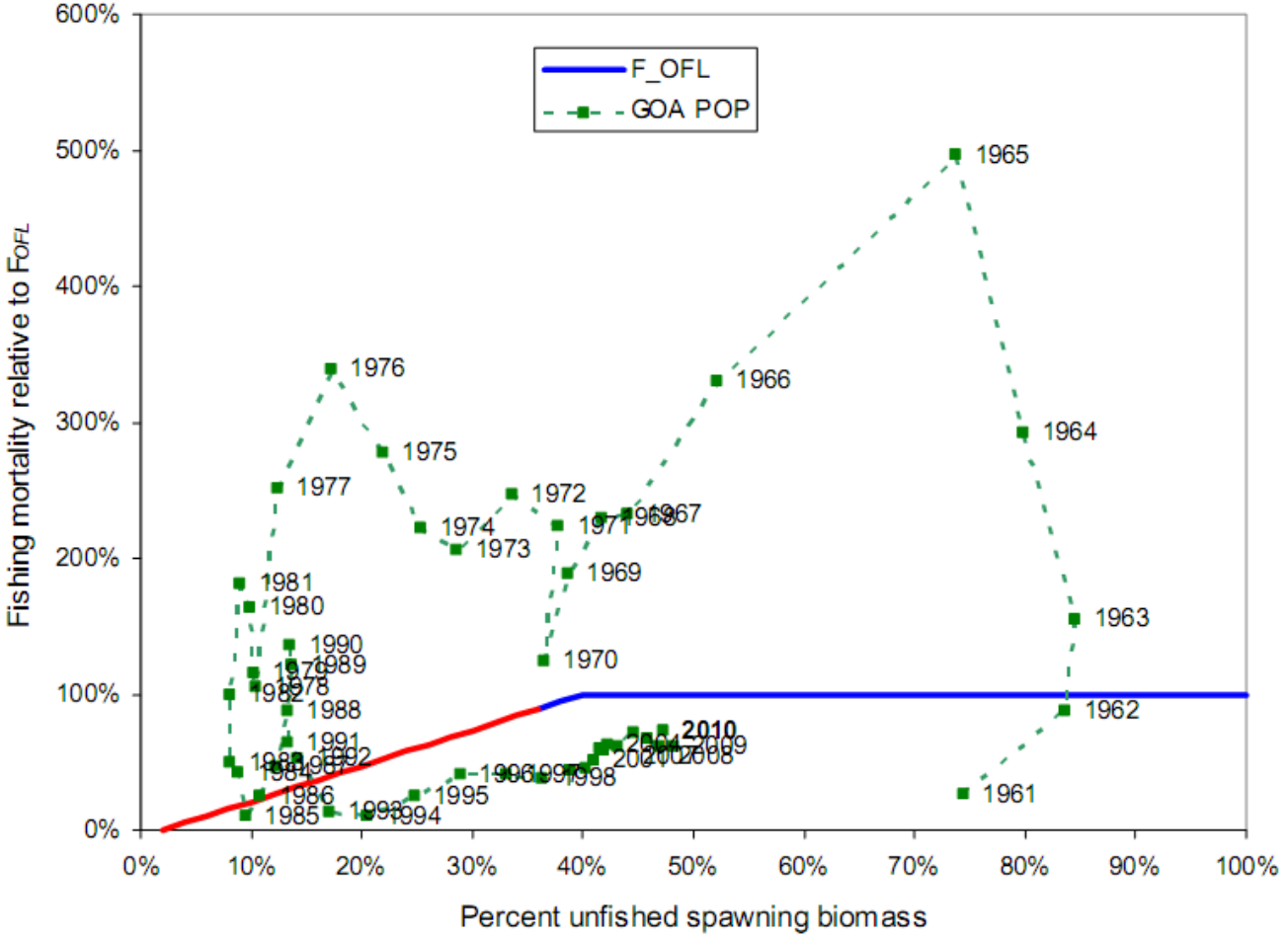
Tier 3a

Survey q=1.97

West: 2,895 (-9%)

Central: 10,737 (+6%)

East: 3,952 (+3%)



Northern RF ABC Summary

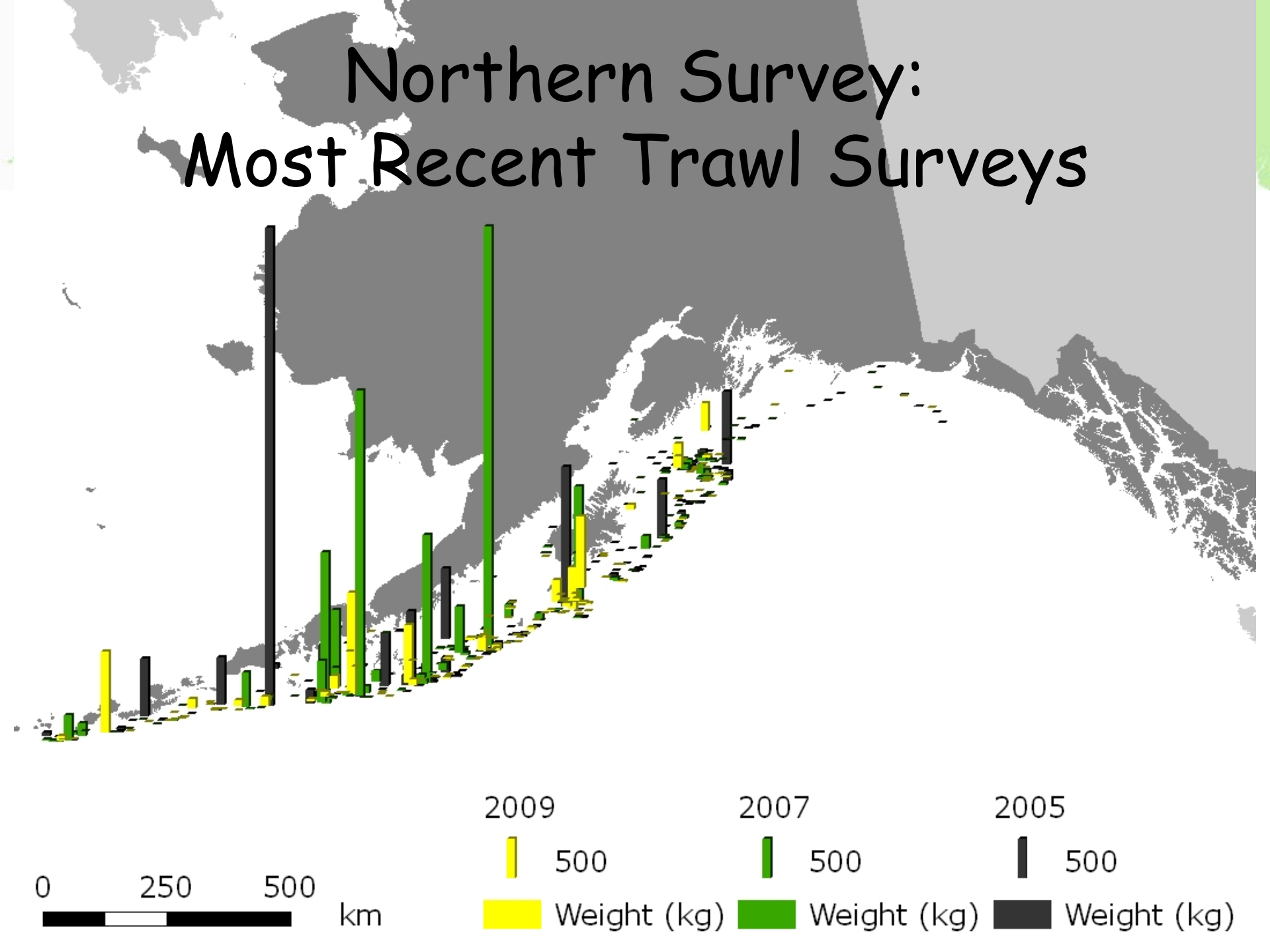
Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

10. Northern rockfish

- **Tier 3a, update 2007 assessment model**
- **Changes in input data:**
  - Updated catch 2008, preliminary catch 2009, 2007 fishery sizes, 2009 survey biomass, 2007 survey ages
  - Data trends
  - Pilot program catch
  - Survey biomass estimate: 2009 estimate 40% of 2007 estimate, highly variable surveys

Summary p. 29, Chapter p. 817

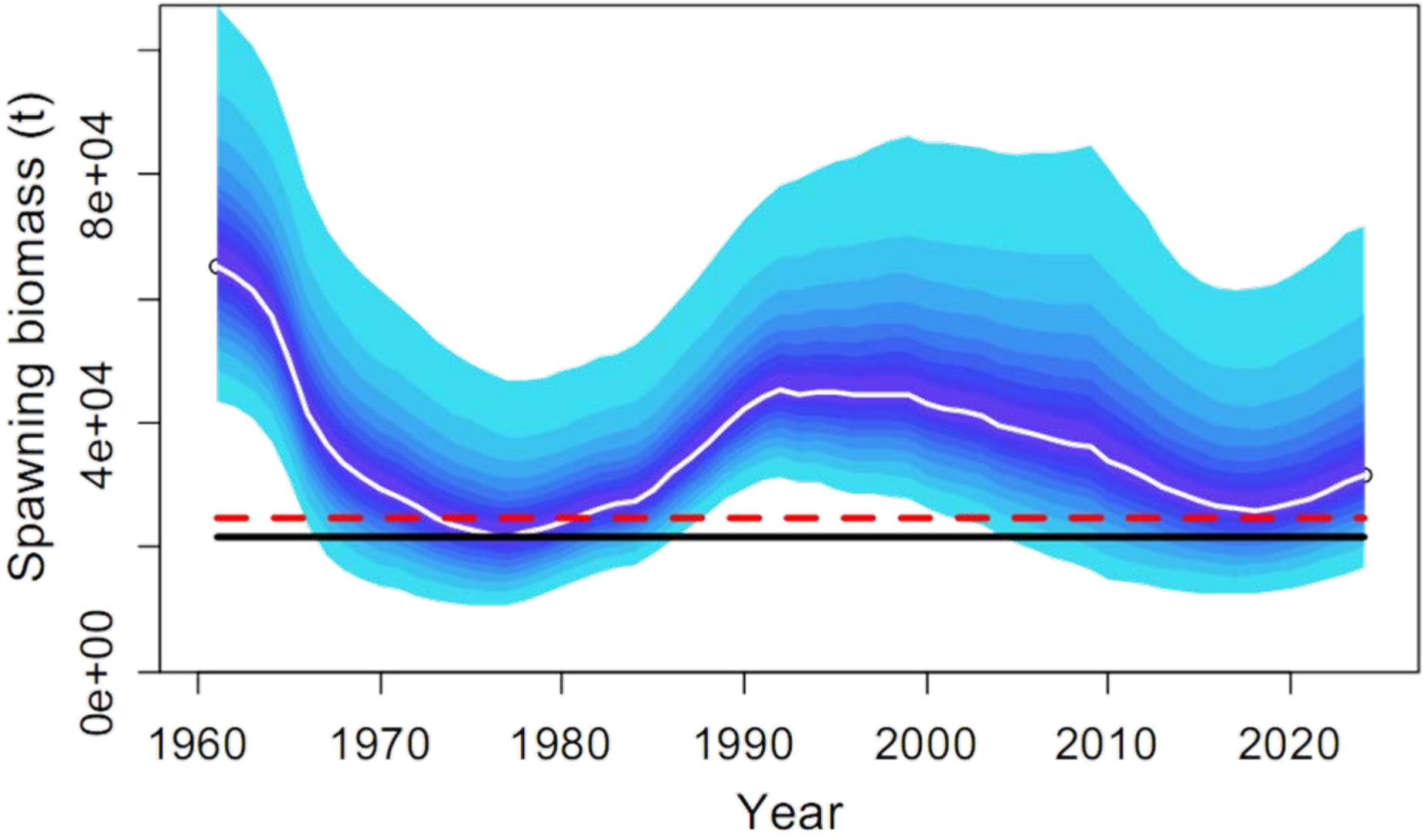
Northern Survey: Most Recent Trawl Surveys



Northern – Model Evaluation

- **Changes in assessment methods**
  - Multinomial sample-size issues
    - Past ages/lengths from few hauls
      - Multinomial N = number of hauls
      - But done inconsistently
  - Alternative 'hybrid' method developed this year
    - Square root of (number of hauls*number of lengths/ages) scaled to maximum of 50
    - Achieved better balance between data sets and years
    - Improved survey fit

Northern rockfish spawning biomass



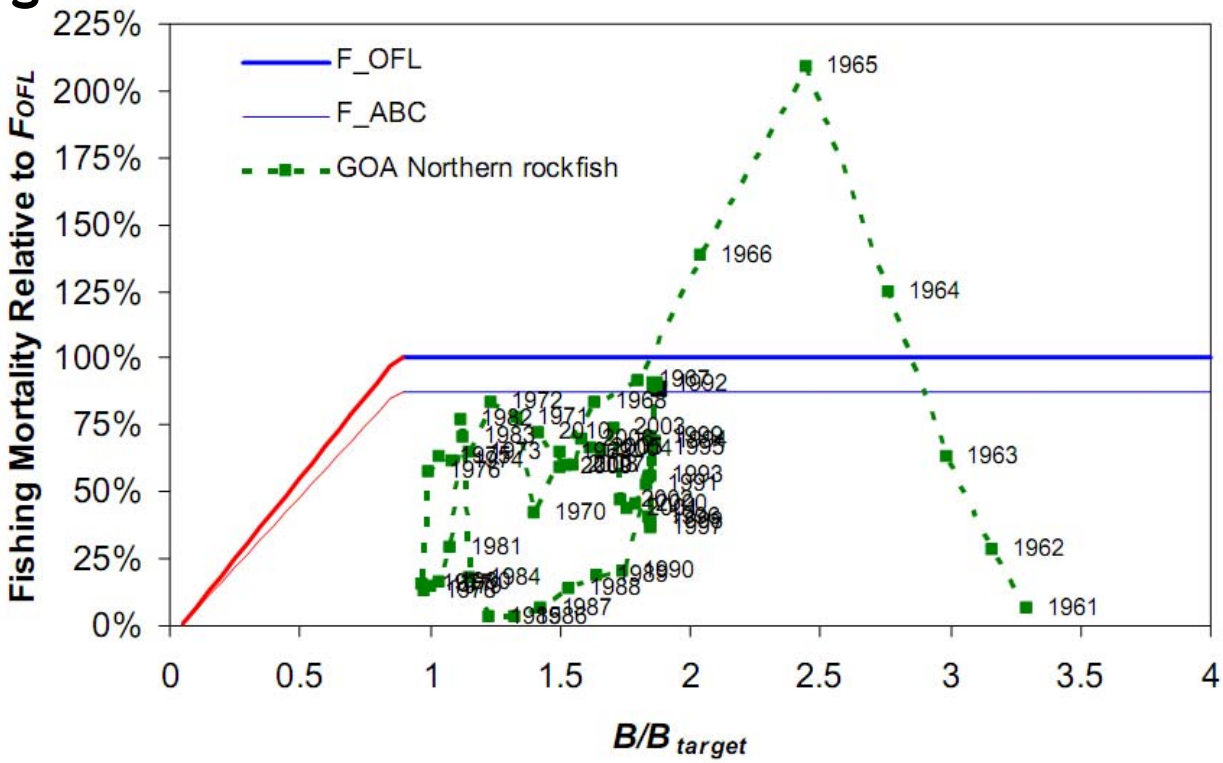
Northern rockfish

Tier 3a

Research:

- Input sample sizes
- Trawl/untrawlable
- Alternative surveys
- Maturity study

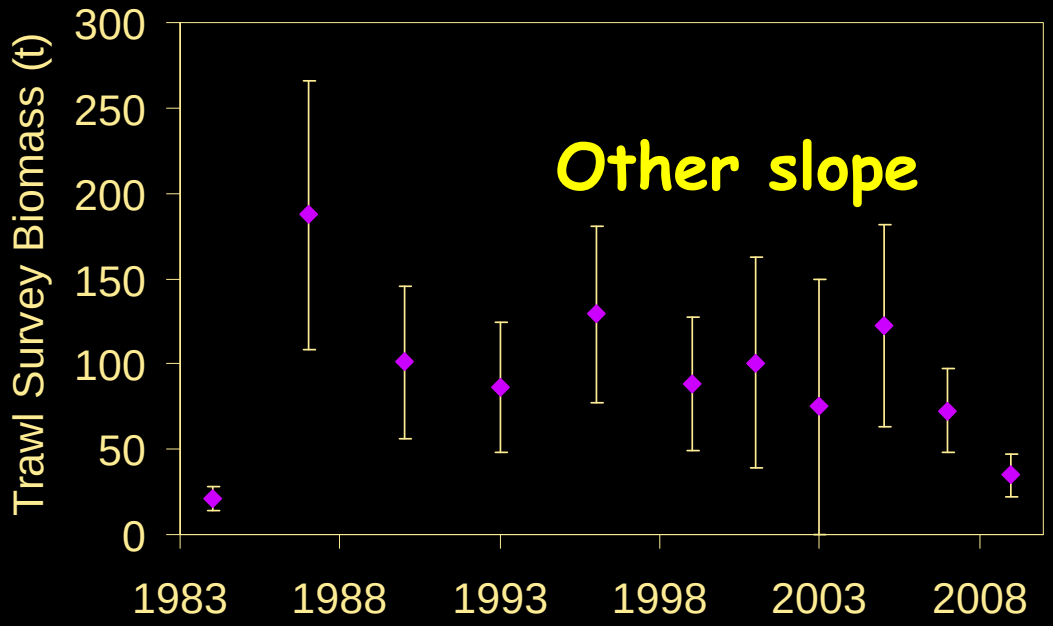
	Biomass	OFL	ABC
2010	103,300	6,070	5,100
2011		5,730	4,810

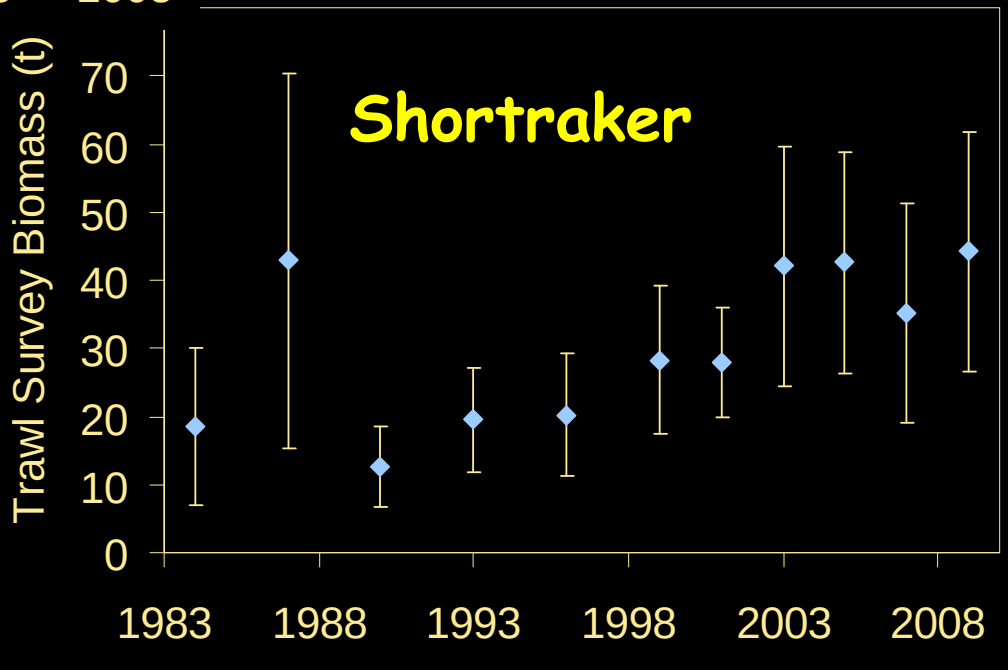


11. Shortraker – Other slope RF ABC Summary

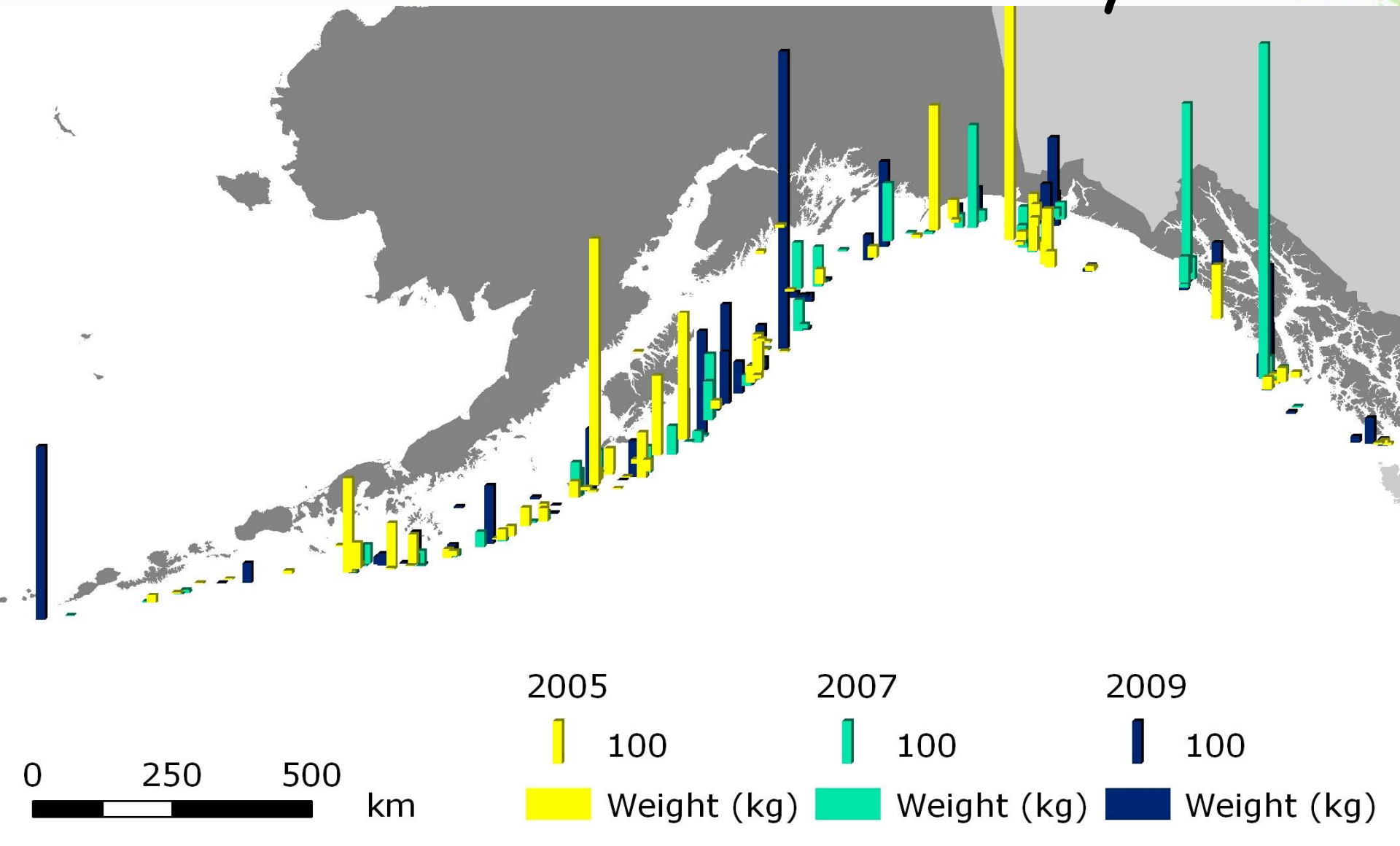
Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

Other slope, shortraker rockfish





Shortraker survey most recent trawl surveys



11. Other slope, shortraker rockfish

Summary p. 31, Chapter p. 875

Other slope:

Sharpchin rockfish
Redstripe rockfish
Harlequin rockfish
Silvergray rockfish
Redbanded rockfish
Darkblotched rockfish
Splitnose rockfish
Greenstriped rockfish
Vermilion rockfish
Bocaccio
Pygmy rockfish
Yellowmouth rockfish

Shortraker	Biomass	OFL	ABC
2010	40,626	1,219	914
2011		1,219	914

Other slope rockfish	Biomass	OFL	ABC
2010	76,867	4,881	3,749
2011		4,881	3,749

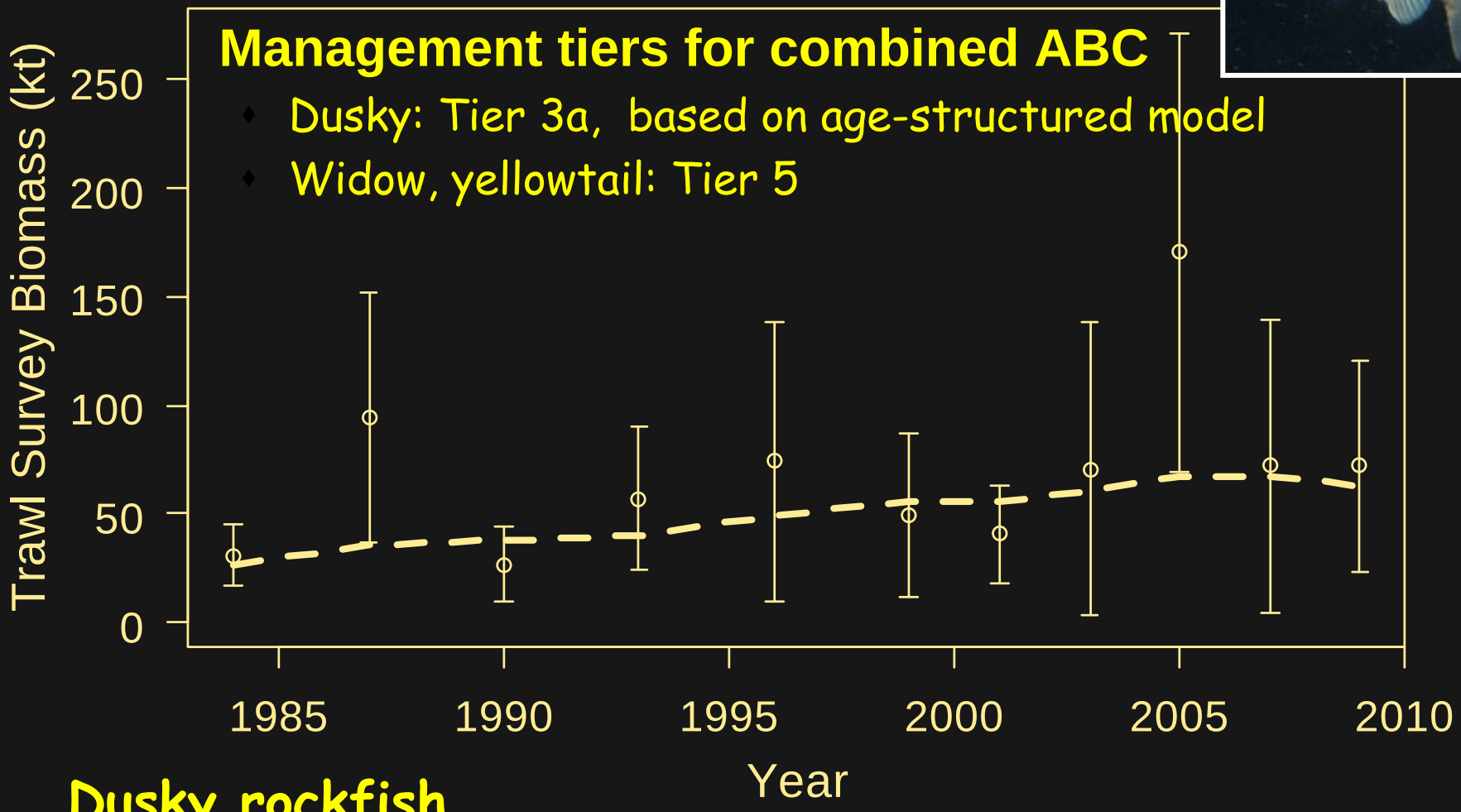
12. PSR RF ABC Summary

Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

12. Pelagic Shelf rockfish

Management tiers for combined ABC

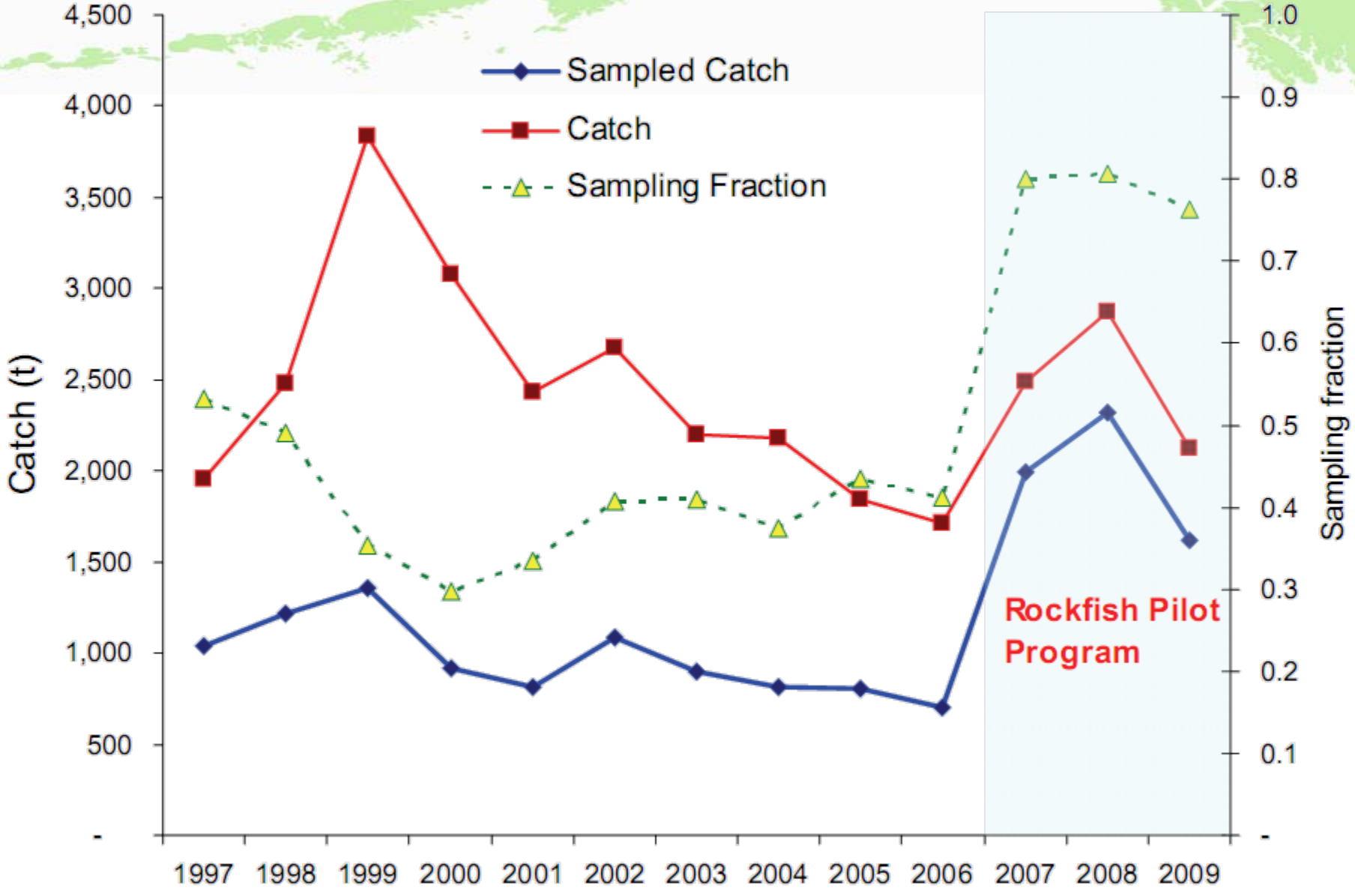
- Dusky: Tier 3a, based on age-structured model
- Widow, yellowtail: Tier 5



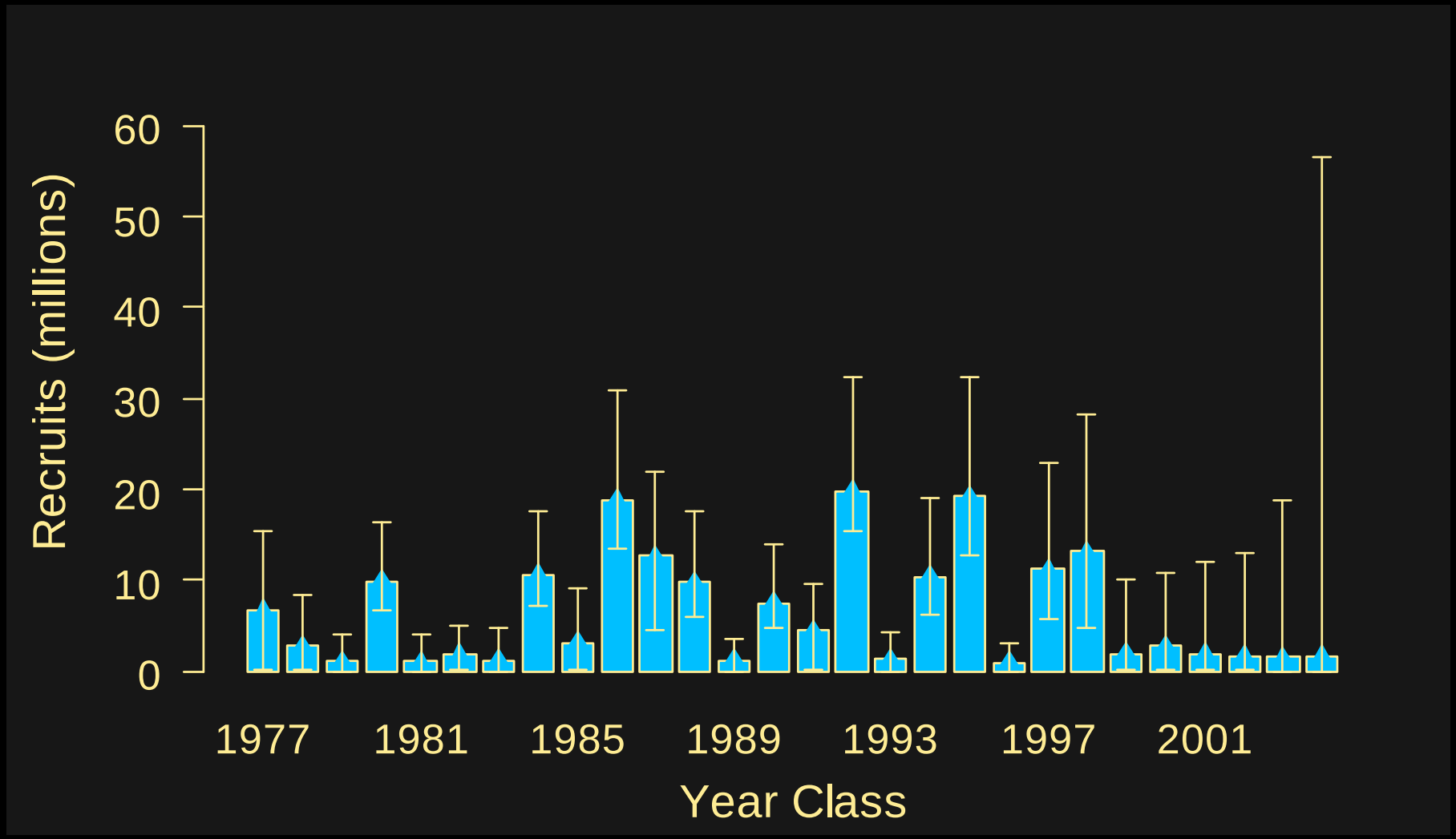
Dusky rockfish

Summary p. 32, Chapter p. 925

Central Gulf Sampled Dusky Catch



Dusky rockfish recruitment

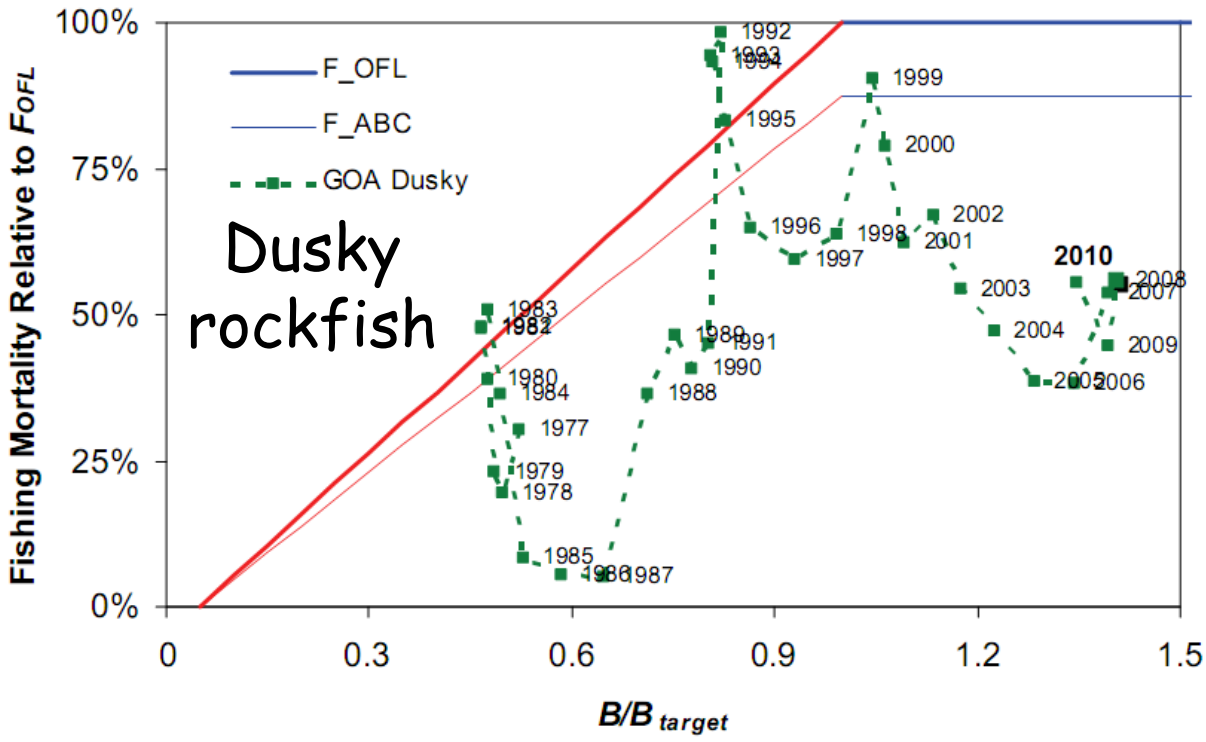


Pelagic shelf rockfish summary

Pelagic shelf rockfish	Biomass	OFL	ABC
2010	69,632	6,142	5,059
2011		5,739	4,727

Dusky, Widow and yellowtail rockfish

- 4% increase over last year's ABC



Rougheye-blackspotted ABC Summary

Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

13. Rougheye Rockfish Complex

- **Orr and Hawkins 2008 formally verified two species**
  - Rougheye (*Sebastes aleutianus*)
  - Blackspotted rockfish (*S. melanostictus*)
  - 2009 trawl survey: collect biological and genetic data
  - Plan Team concerned that survey database contains unreliable ID records

Summary p. 34, Chapter p. 993

RE/BS Rockfish Complex

- **Tier 3a, both species together**
  - 2007 and 2009 trawl survey split RE and BS
- **Changes in input data**

  Fishery: 2008 updated catch
  2009 preliminary catch
  2004 & 2006 ages, 2007 size

  Trawl survey: 2009 biomass, 1987 & 2007 ages

  Longline survey: 2008-2009 RPW, 2008-2009 size
- **Data Trends**

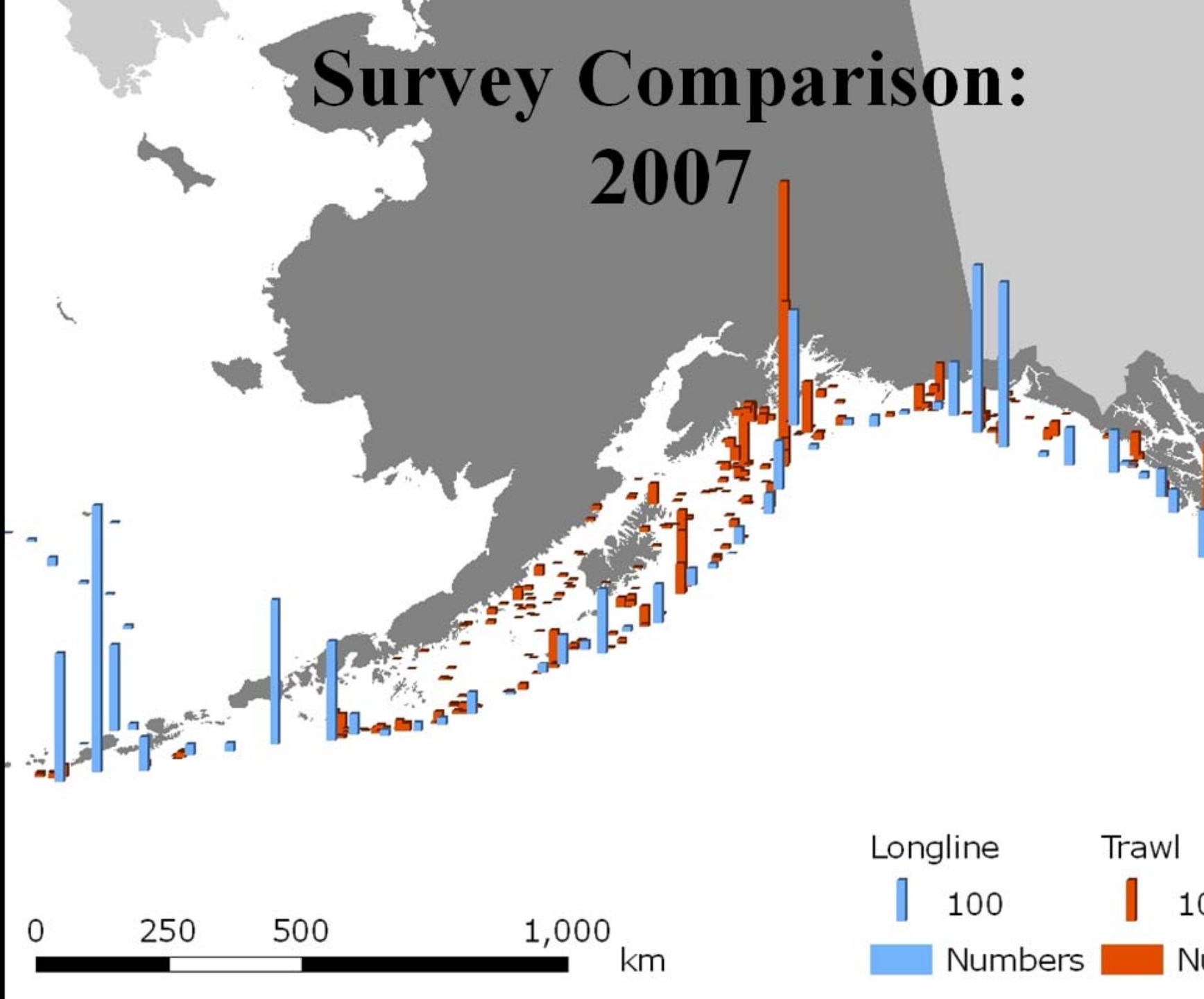
  Trawl survey biomass:

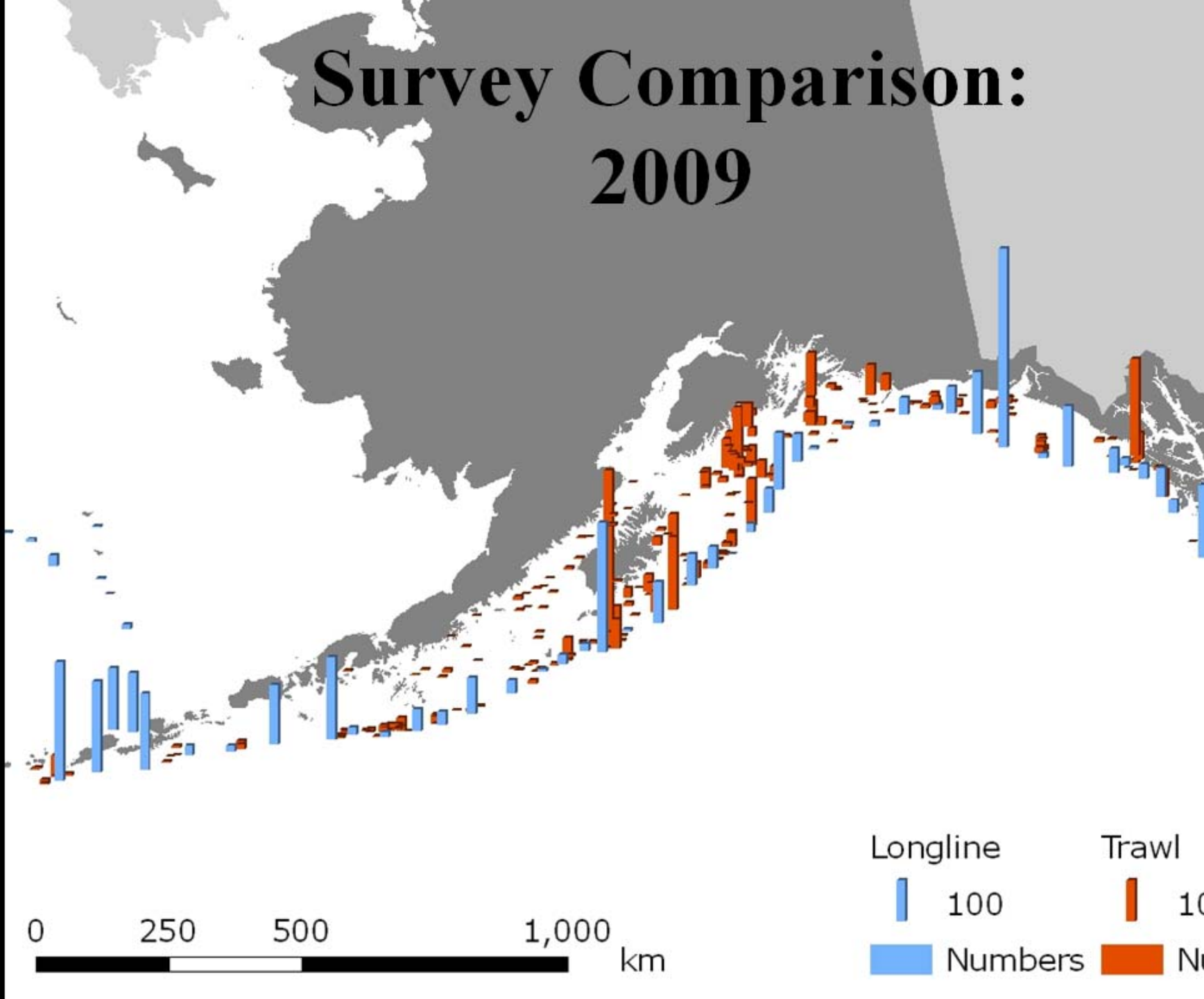
  Decreased 15%

  Longline RPW:

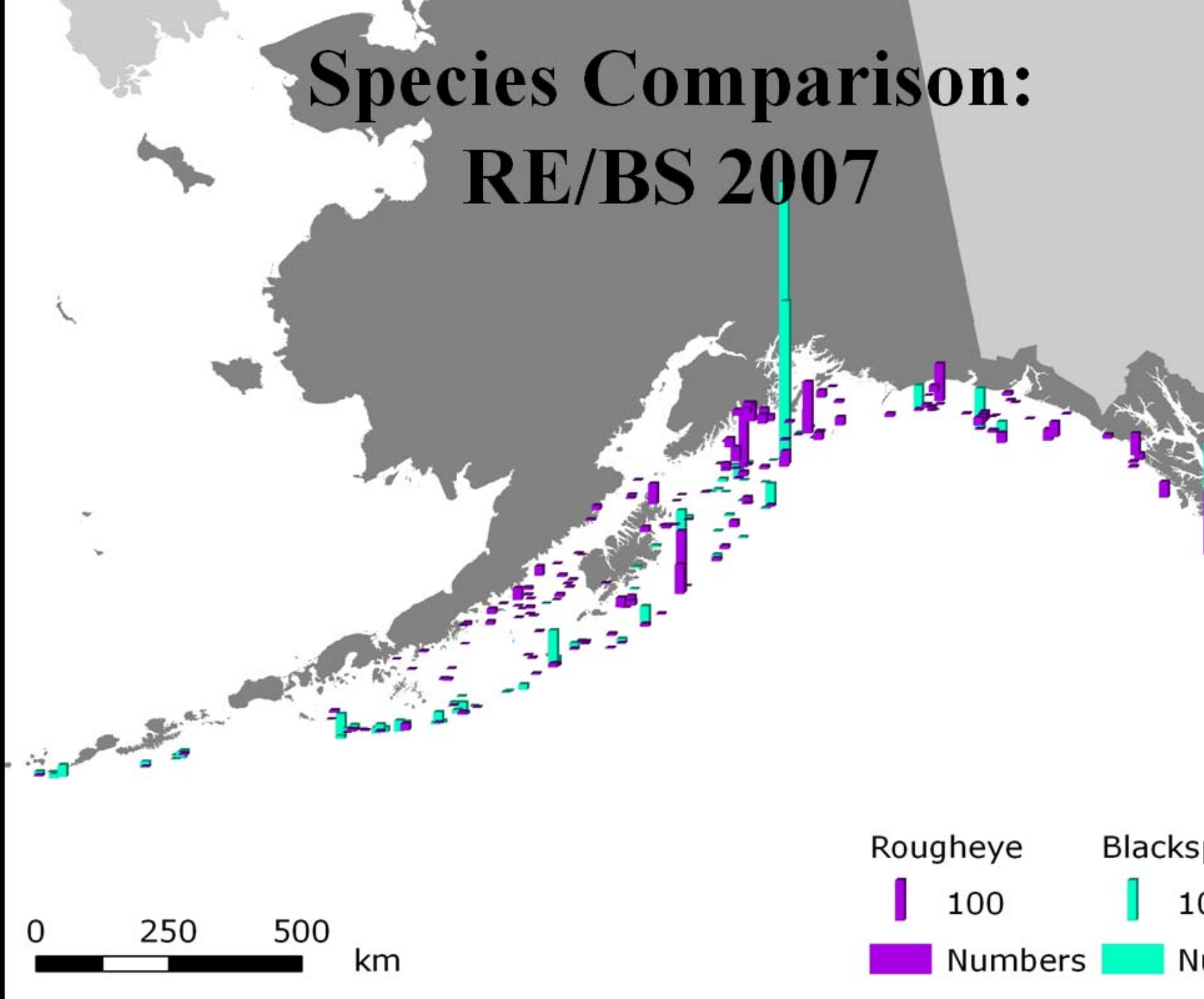
  Decreased 2% in 2008 and 17% in 2009

Survey Comparison: 2007

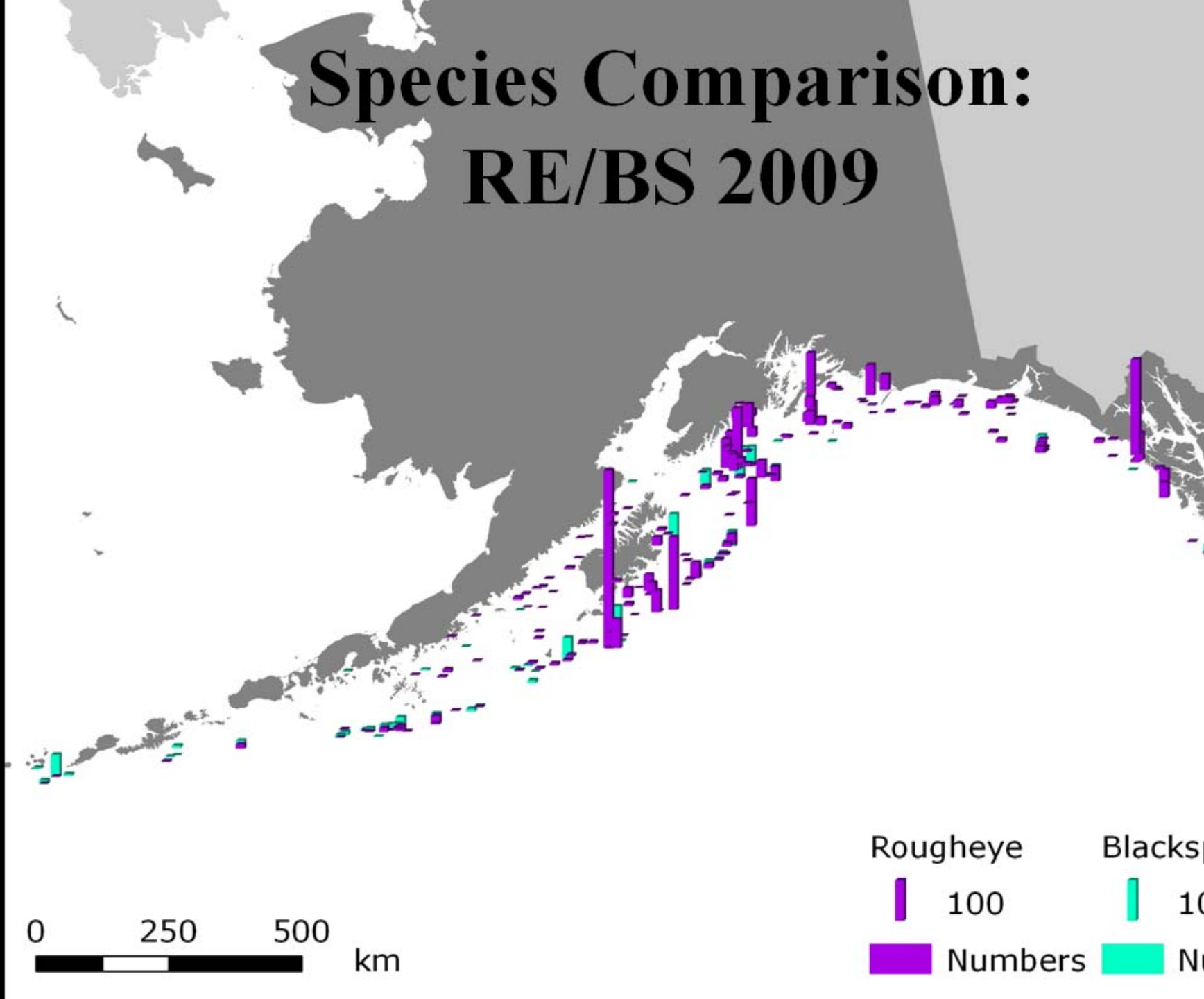



Survey Comparison:
2009
Longline
Trawl
100
Numbers
0
250
500
1,000
km

Species Comparison: RE/BS 2007



Species Comparison: RE/BS 2009

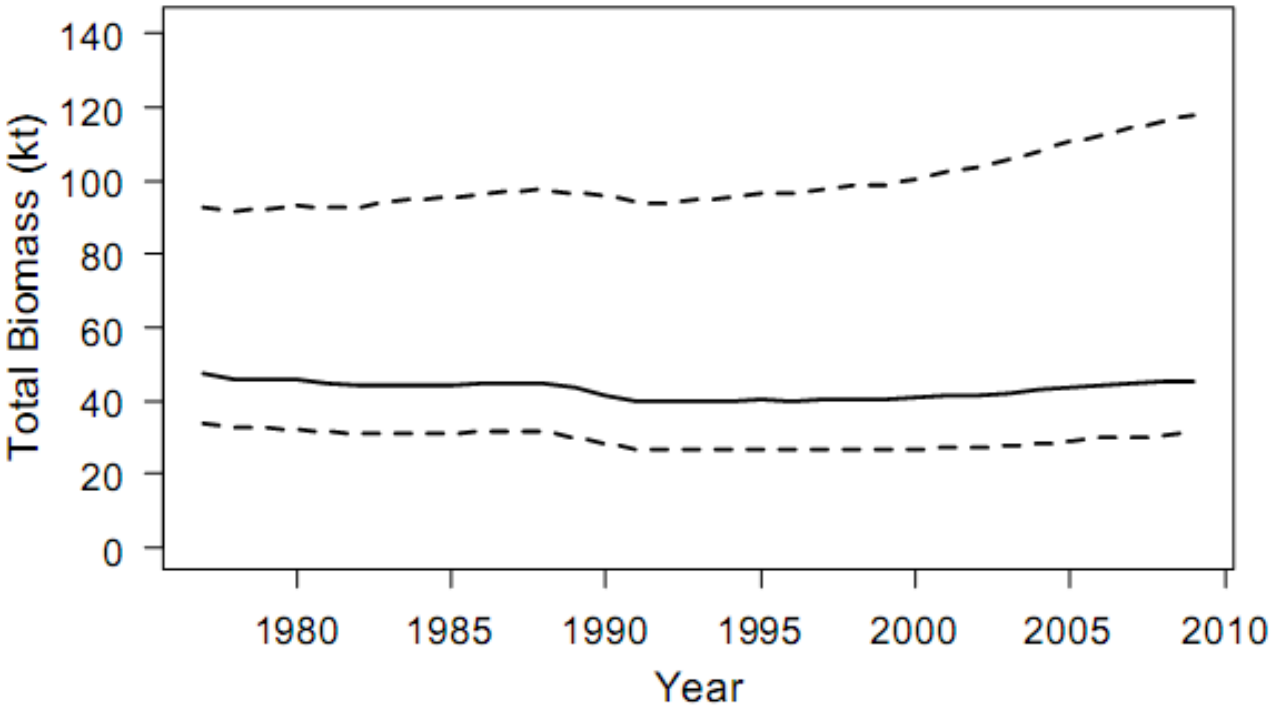


13. RE/BS rockfish summary

Tier 3a

Stable stock trend

Rougheye	Biomass	OFL	ABC
2010	45,751	1,568	1,302
2011		1,581	1,313

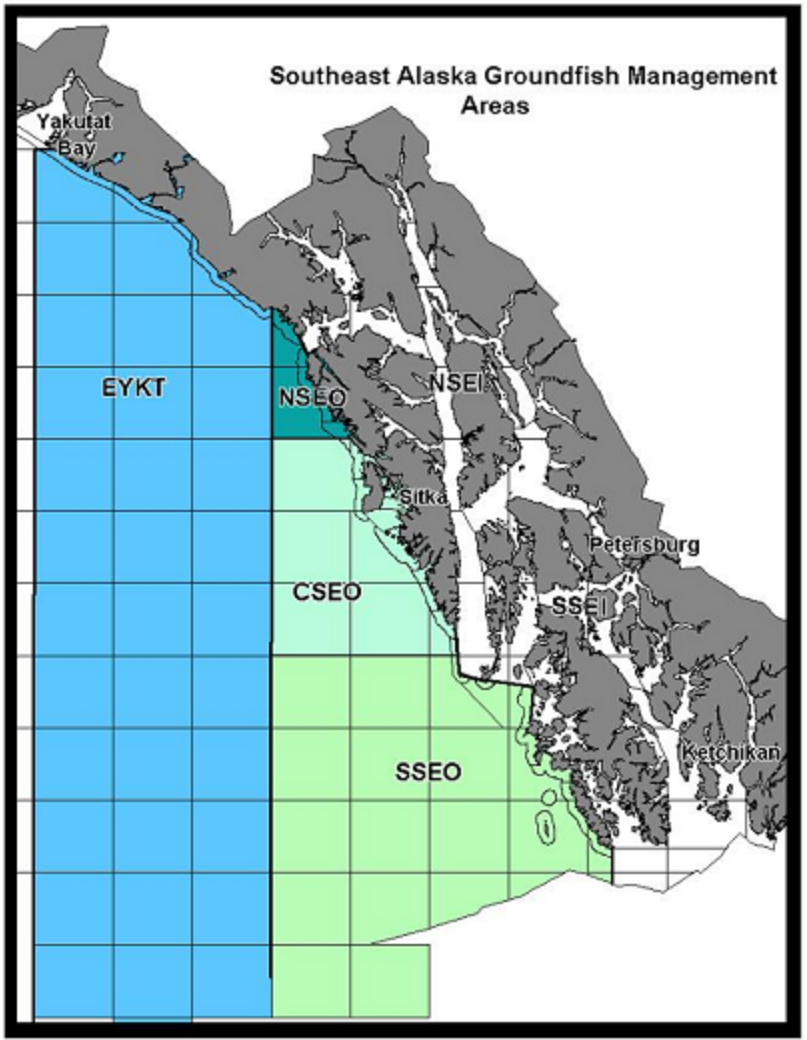


Demersal shelf rockfish ABC Summary

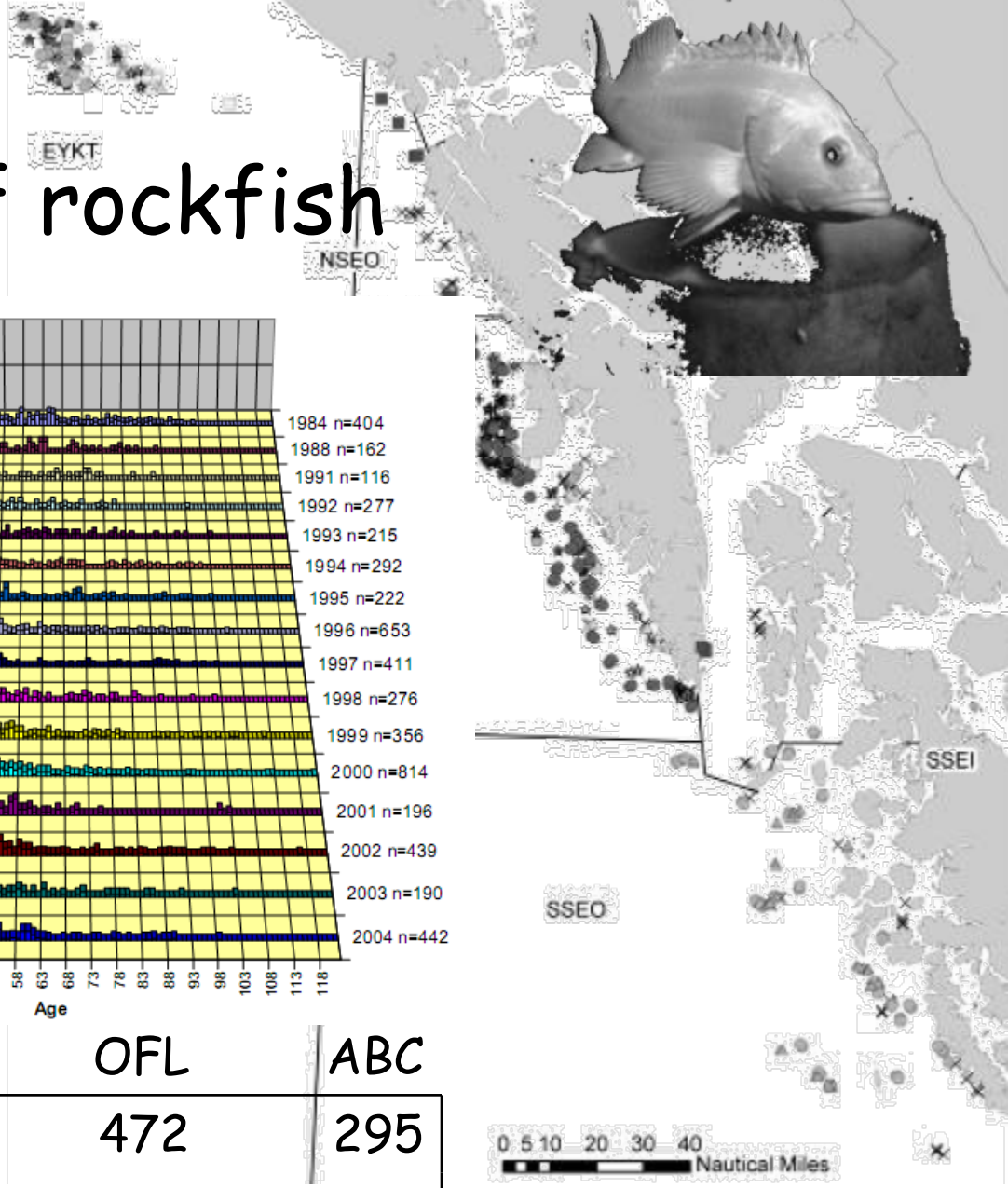
Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

14. Demersal shelf rockfish

- **Mainly yelloweye rockfish**
- Bycatch
  - Unaccounted mortality adds uncertainty
- 2009 survey conducted E. Yakutat-area
  - 46% lower than 2003 estimate from that area



14. Demersal shelf rockfish



Tier 4

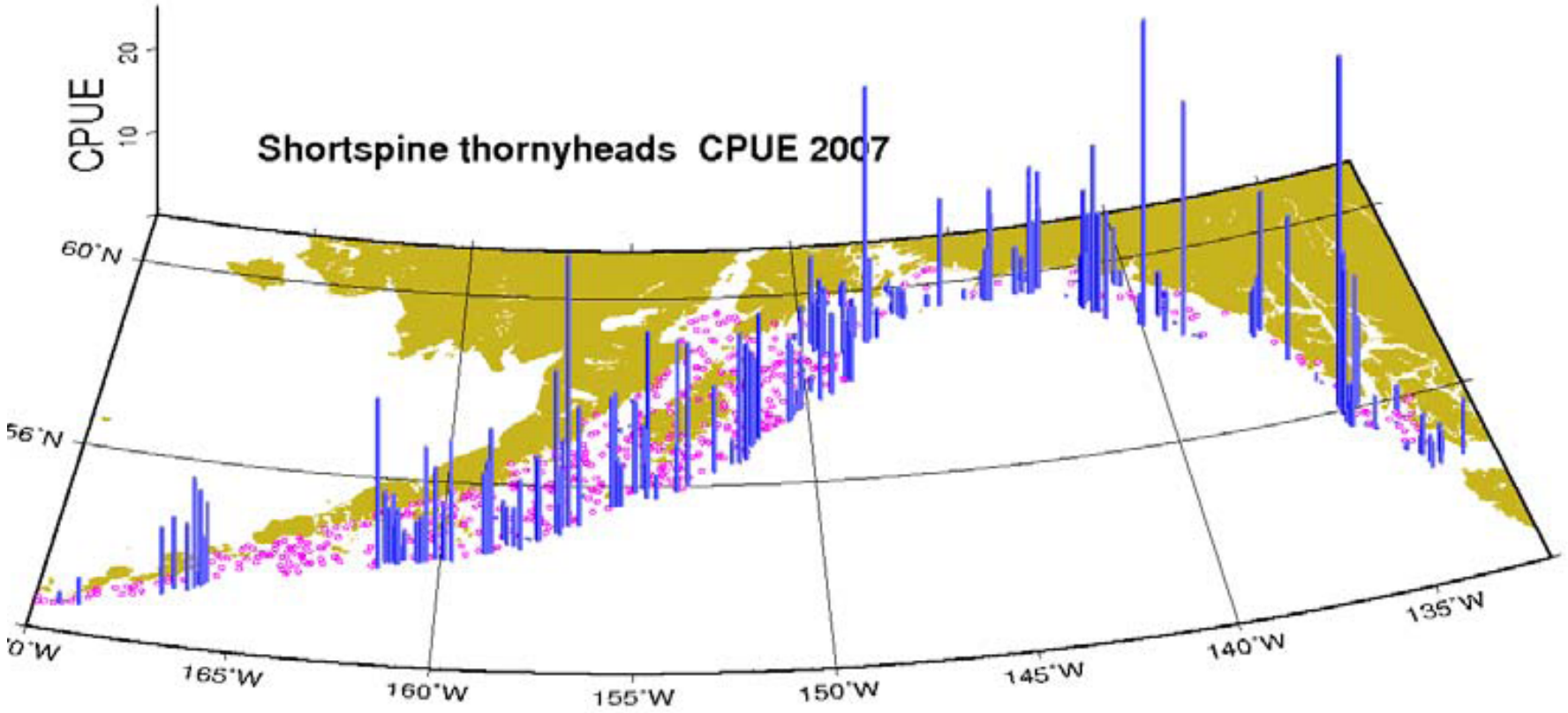
Demersal shelf rockfish	Biomass	OFL	ABC
2010	14,321	472	295
2011		472	295

Thornyhead rockfish ABC Summary

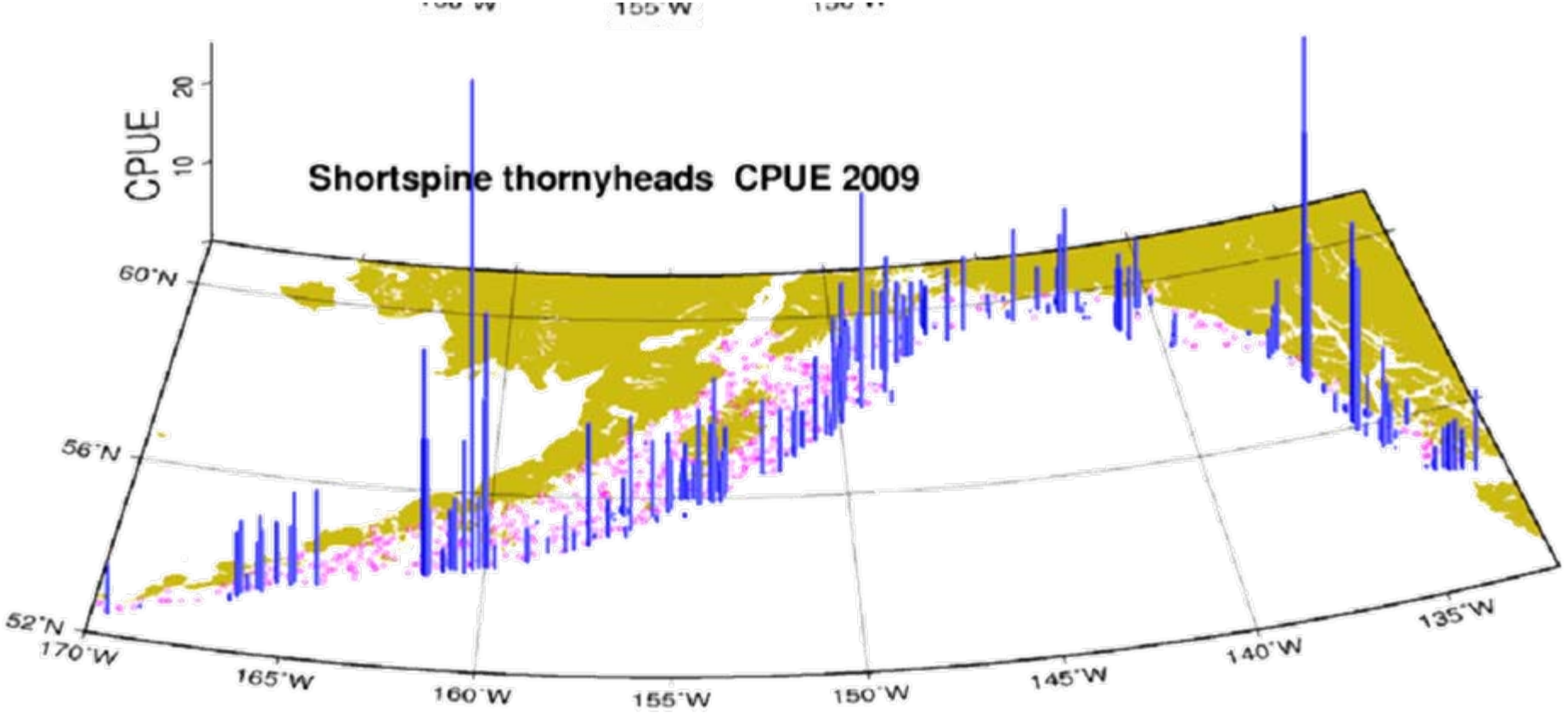
Species	2009 ABC	2010 ABC	Change	
Other Slope rockfish	4,297	3,749	down 548	(13%)
Northern rockfish	4,362	5,100	up 738	(17%)
Pacific ocean perch	15,111	17,584	up 2,473	(16%)
Shortraker – Other slope	898	914	up 16	(2%)
Rougheye/Blackspotted	1,284	1,302	up 18	(1%)
Pelagic shelf rockfish	4,781	5,059	up 278	(6%)
Demersal Shelf Rockfish	362	295	down 67	(19%)
Thornyhead rockfish	1,910	1,770	down 140	(7%)
Sub-total	33,005	35,773	up 2,768	(8%)

15. Shortspine thornyheads

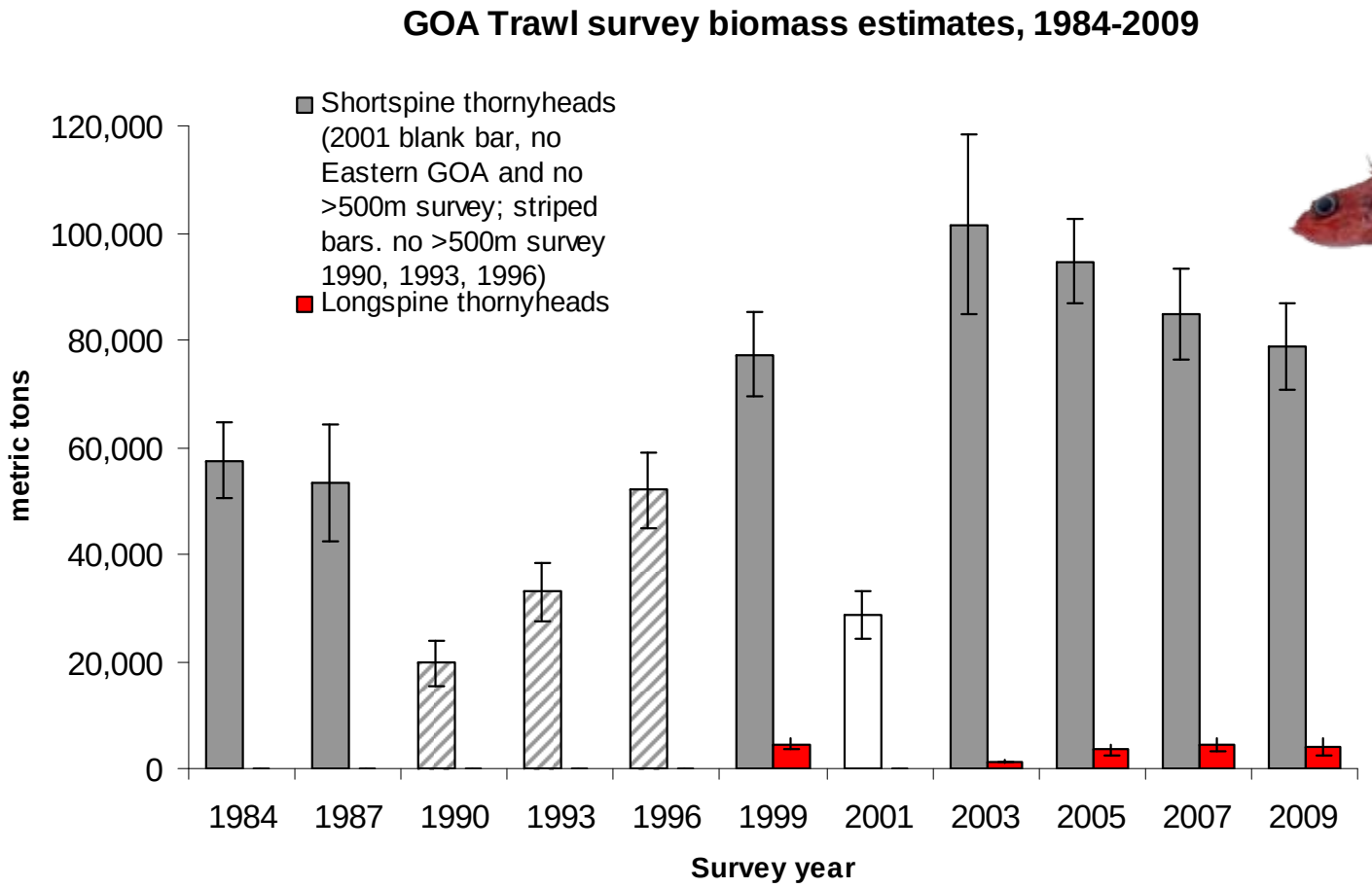
- **Tier 5 species**



Shortspine thornyheads



Summary p. 36, Chapter p. 1,111



- 2009 GOA trawl survey biomass for SST = 78,795 t (CV=0.05)
- Gulfwide 2009 SST biomass declined 9% relative to 2007 survey
- Most of the decrease observed in Central Gulf

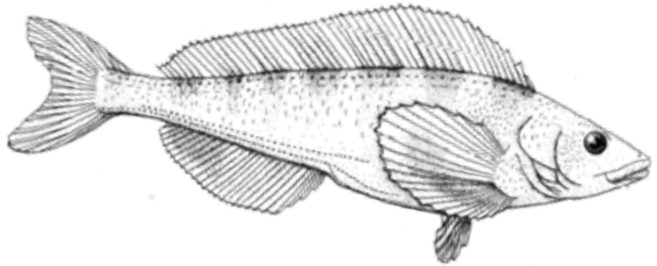
Shortspine thornyheads

- **Natural mortality**
  - Max. ages from 2 studies of 115 and 150 years
  - Average M from above studies is 0.03
  - Preliminary results from Bryan Black's work in line with M=0.03

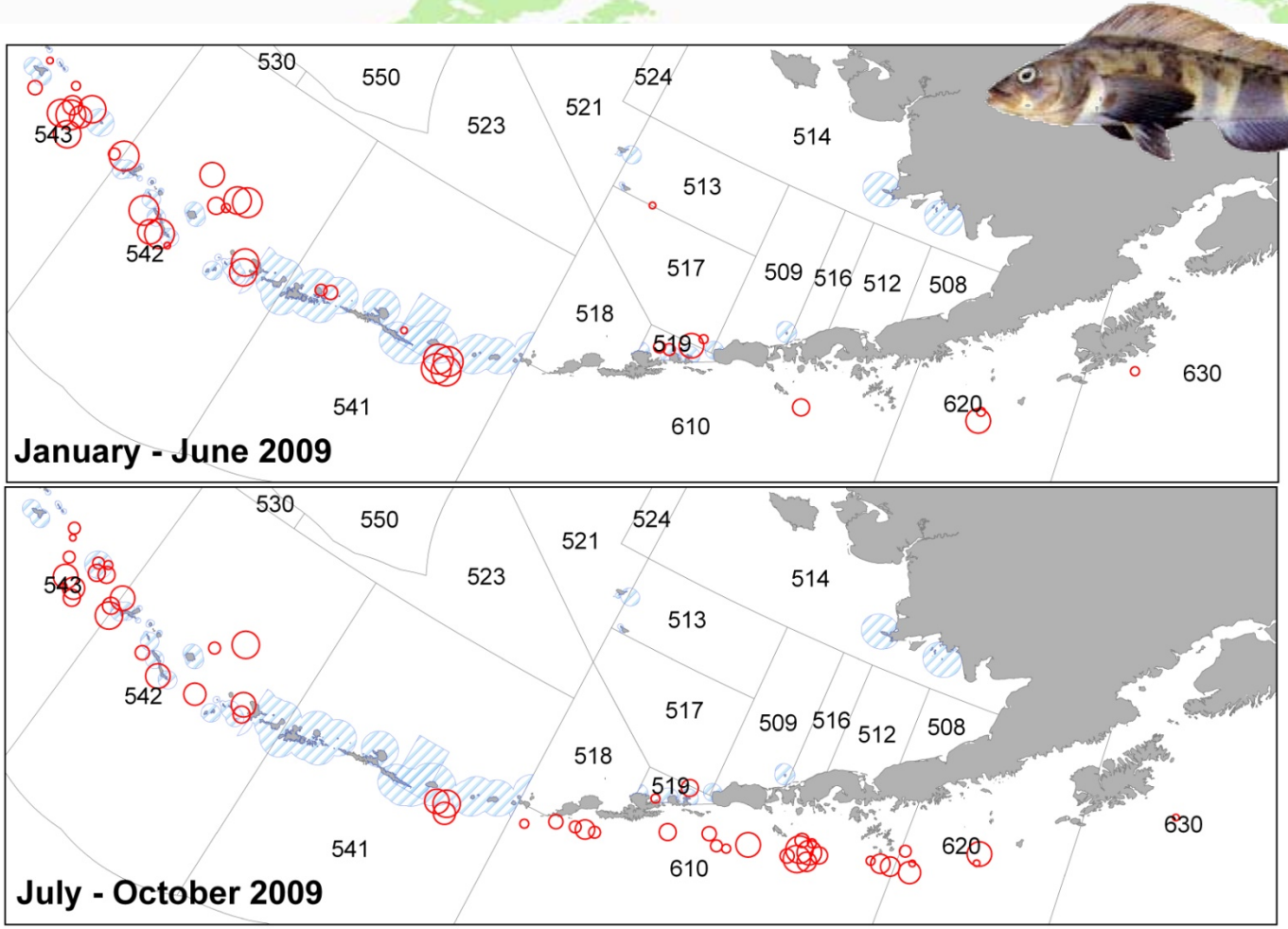
	Biomass	OFL	ABC
2010	78,795	2,360	1,770
2011		2,360	1,770

16. Atka mackerel

- **Catch data updated**
- **Length data from 2007, 2008 and preliminary 2009 GOA fisheries**
- **Age data from 2007 GOA bottom trawl survey**
- **Biomass estimates from 2009 GOA bottom trawl survey**
- **Length data from 2009 GOA bottom trawl survey**



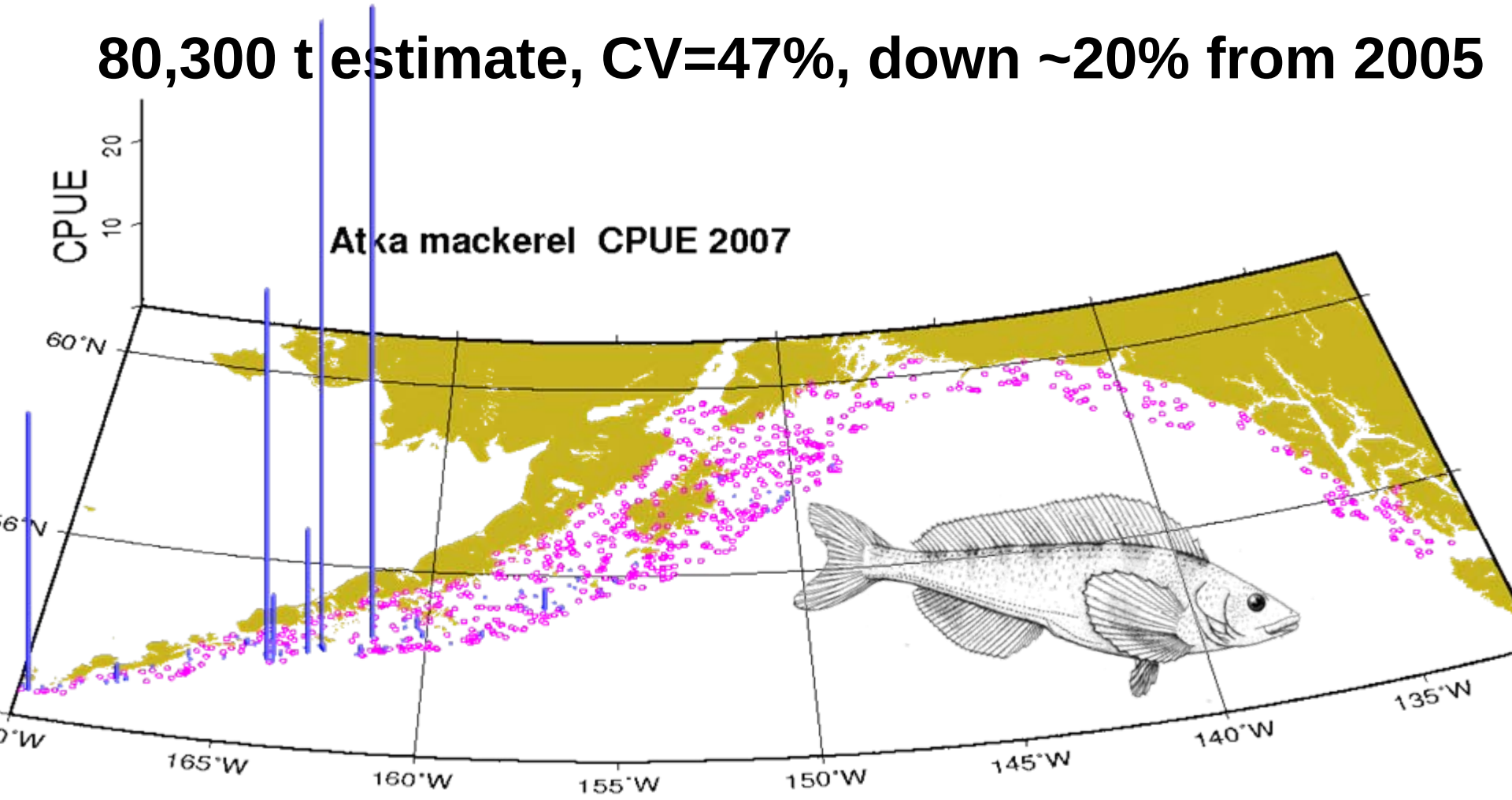
Summary p. 38, Chapter p. 1,147



Observed catches of Atka mackerel in the 2009 fisheries, summed by 20 km2 cells. Open circles represent catches greater than 1 t; closed circles represent catches less than 1 t. Hashed circular areas represent no trawl zones.

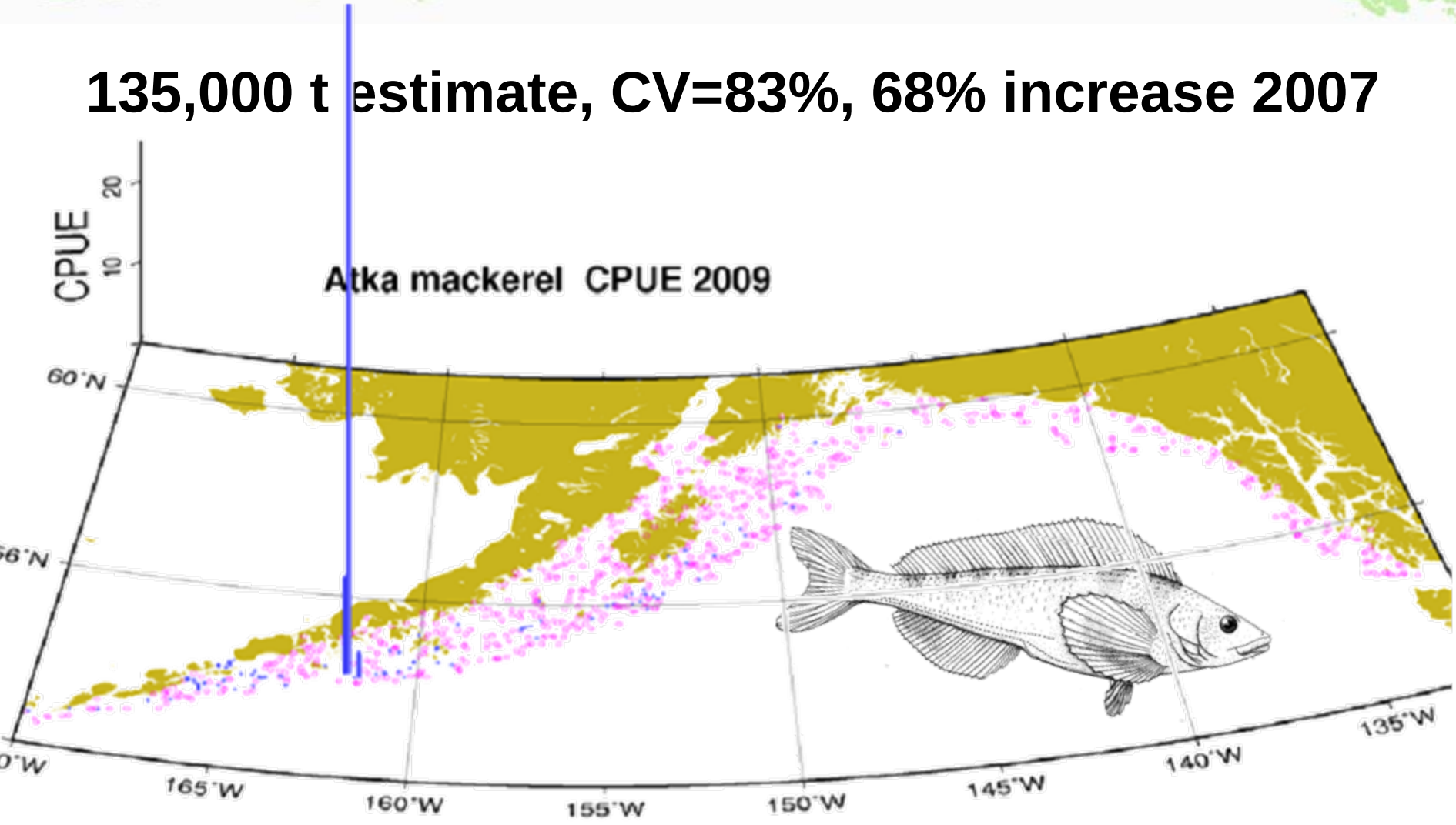
Atka mackerel 2007 survey

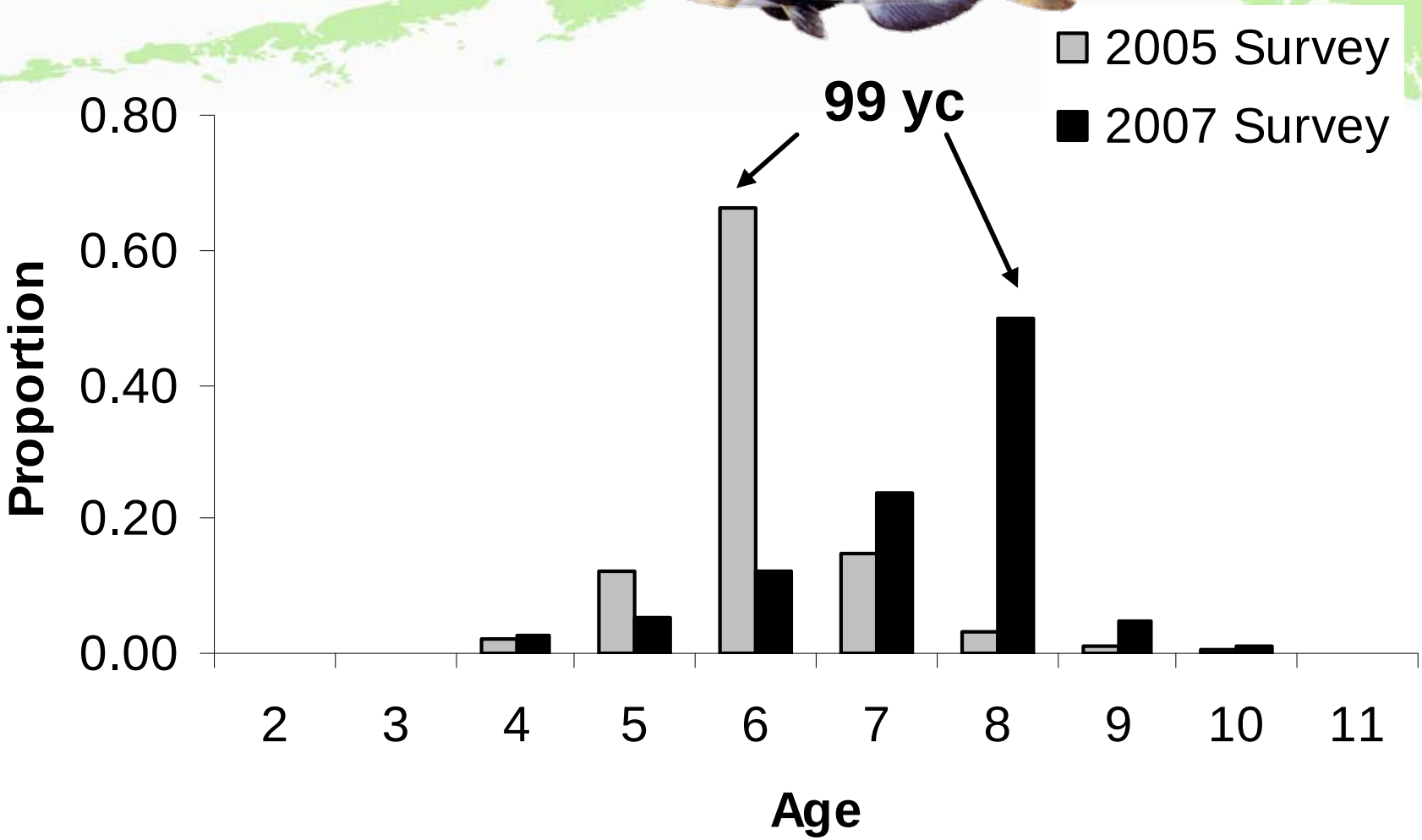
80,300 t estimate, CV=47%, down ~20% from 2005



GOA Atka mackerel 2009 survey

135,000 t estimate, CV=83%, 68% increase 2007





Atka mackerel age distributions from the 2005 and 2007 Gulf of Alaska bottom trawl surveys (315 and 143 fish were aged respectively, from the 2005 and 2007 surveys).

GOA Atka Mackerel Recent catches, ABCs and TACs

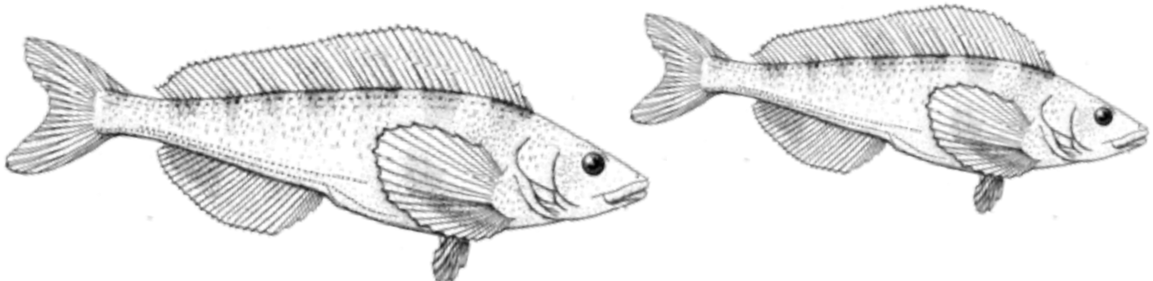
Year	Catch (t)	ABC (t)	TAC (t)
2005	799	600	600
2006	876	4,700	1,500
2007	1,459	4,700	1,500
2008	2,109	4,700	1,500
2009*	2,221	4,700	2,000

* Catch through 07-Nov-09

Atka mackerel

- **Tier 6 species**
- **No directed fishing since 1996**
  - Bycatch mainly in rockfish fishery relatively stable
- **TAC set to meet incidental catch levels**
- **ABC = 4,700**
  - 2009 catches around 2,200 t

No change from 2008



ABC: Skates

Species	2009 Catch	ABC 2009	ABC 2010	Change	
Pollock	42,297	49,900	84,745	up 34,845	(70%)
Pacific Cod	38,401	55,300	79,100	up 23,800	(43%)
Sablefish	10,698	11,160	10,370	down 790	(7%)
Flatfish	16,657	125,617	119,583	down 6,034	(5%)
Arrowtooth flounder	24,438	221,512	215,882	down 5,630	(3%)
Rockfish	22,408	33,005	35,773	up 2,768	(8%)
Atka mackerel	2,221	4,700	4,700	same	(0%)
Skates	3,935	8,321	8,273	down 48	(1%)
Other Species	2,327	6,540	7,075	up 535	(8%)
Total	163,382	516,055	565,501	up 49,446	(11%)

Summary: Page 40
Chapter: Page 1177

17. Skates

- **In GOA, 2 main target species**
  - Big skate (*Raja binoculata*)
  - Longnose skate (*Raja rhina*)
- **3rd group composed of many species**
  - *Bathyraja spp.*
  - not targeted to date

Rough relative biomass estimates (in GOA)

Big skate ~50%,

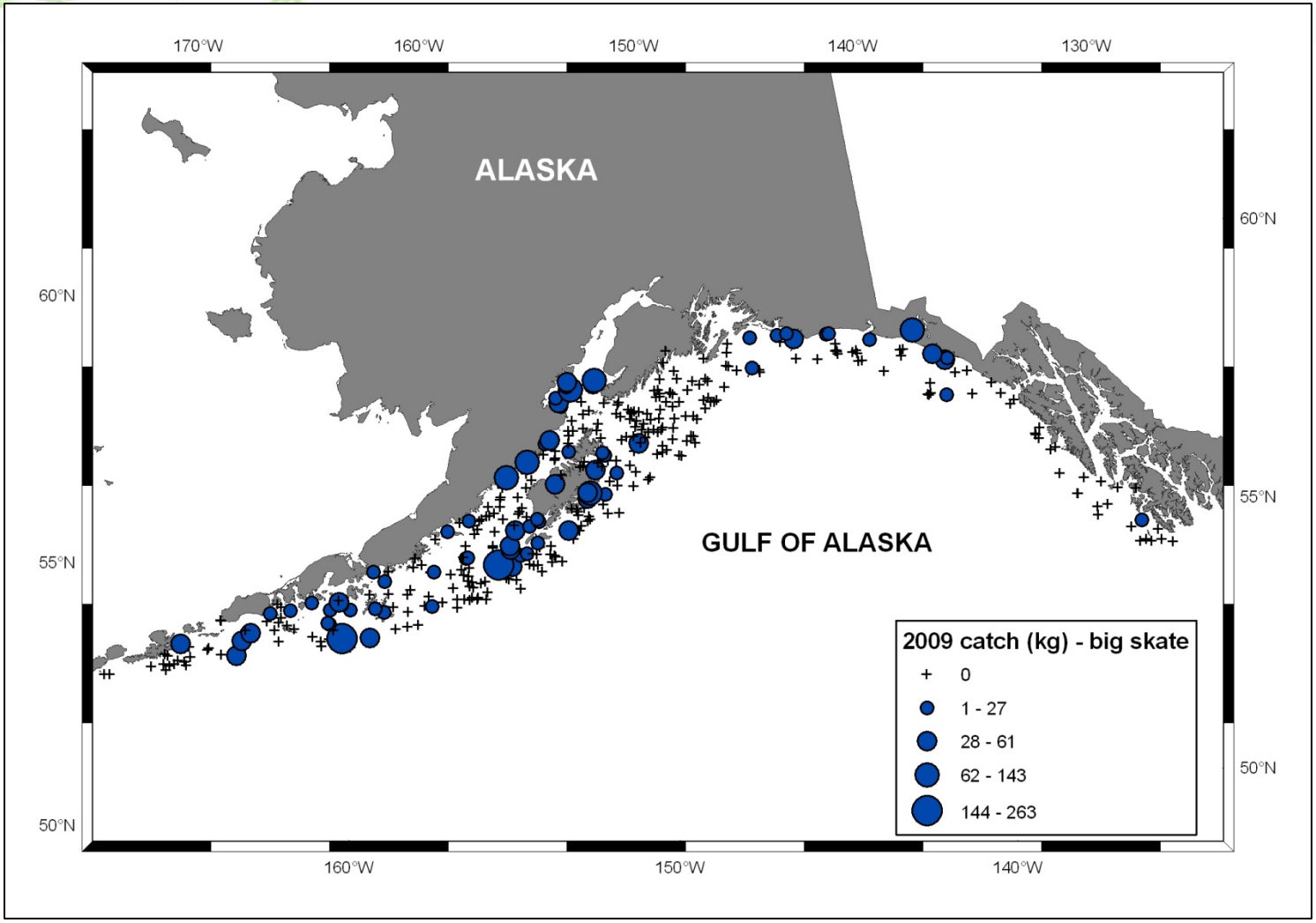
longnose about 32%,

~18% to *Bathyraja spp.*

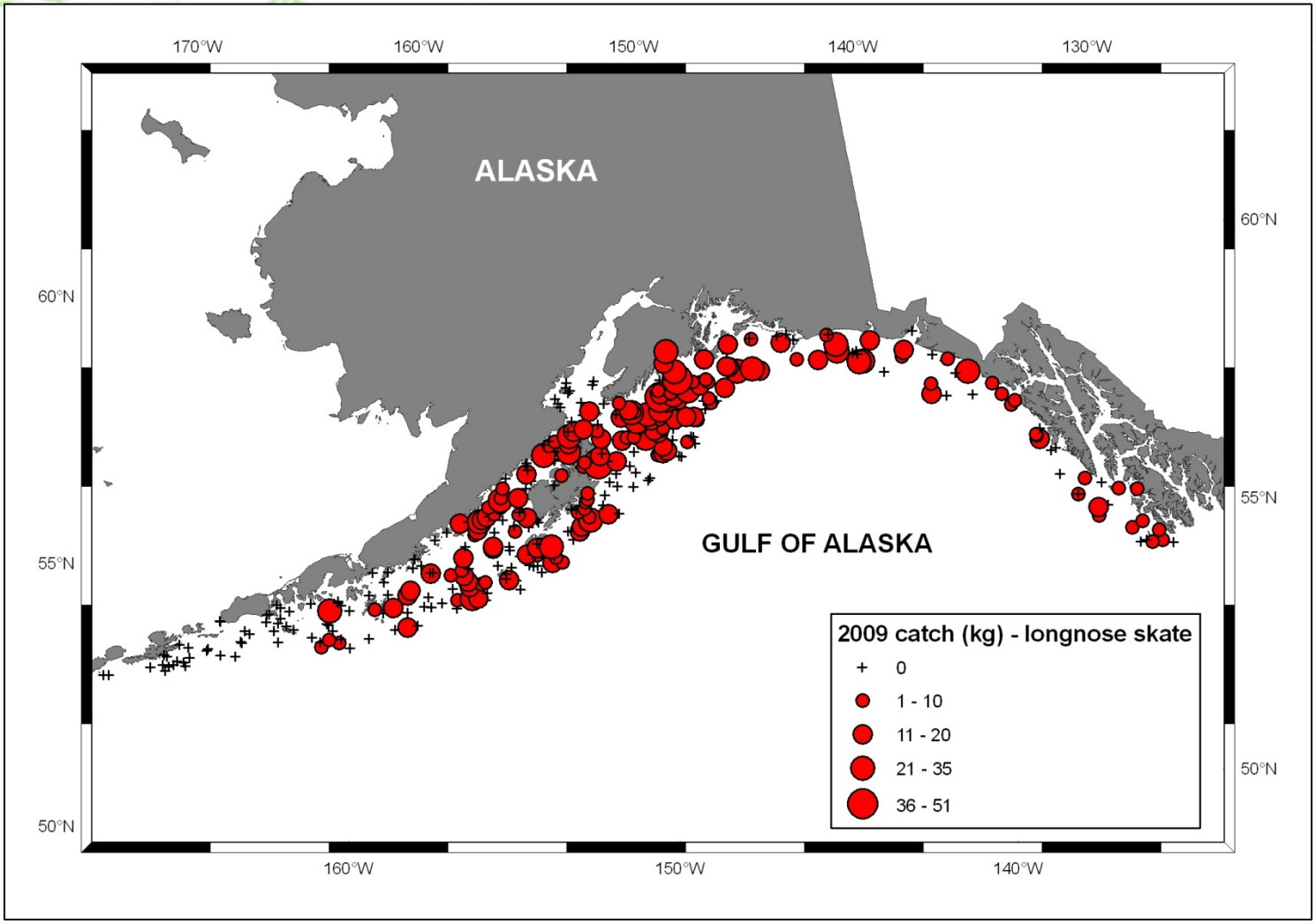
Skates

Species	2009 catch	ABC 2009	ABC 2010	Change
Big skate	1,811	3,330	3,328	down 2 (0%)
Longnose skate	1,117	2,887	2,852	down 35 (1%)
Other skates	1,007	2,104	2,093	down 11 (1%)
All skates	3,935	8,321	8,273	down 48 (1%)

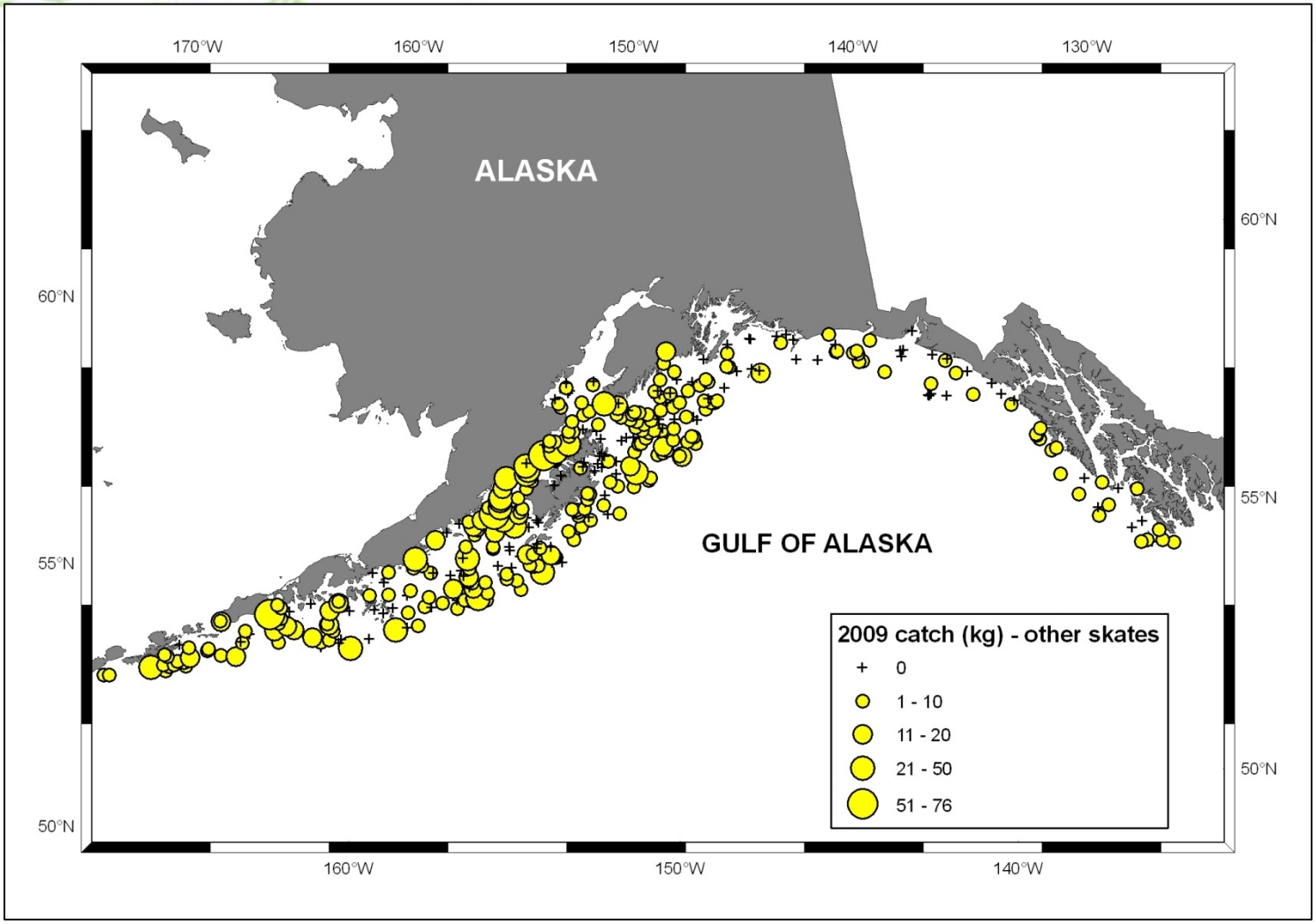
distribution - big skate



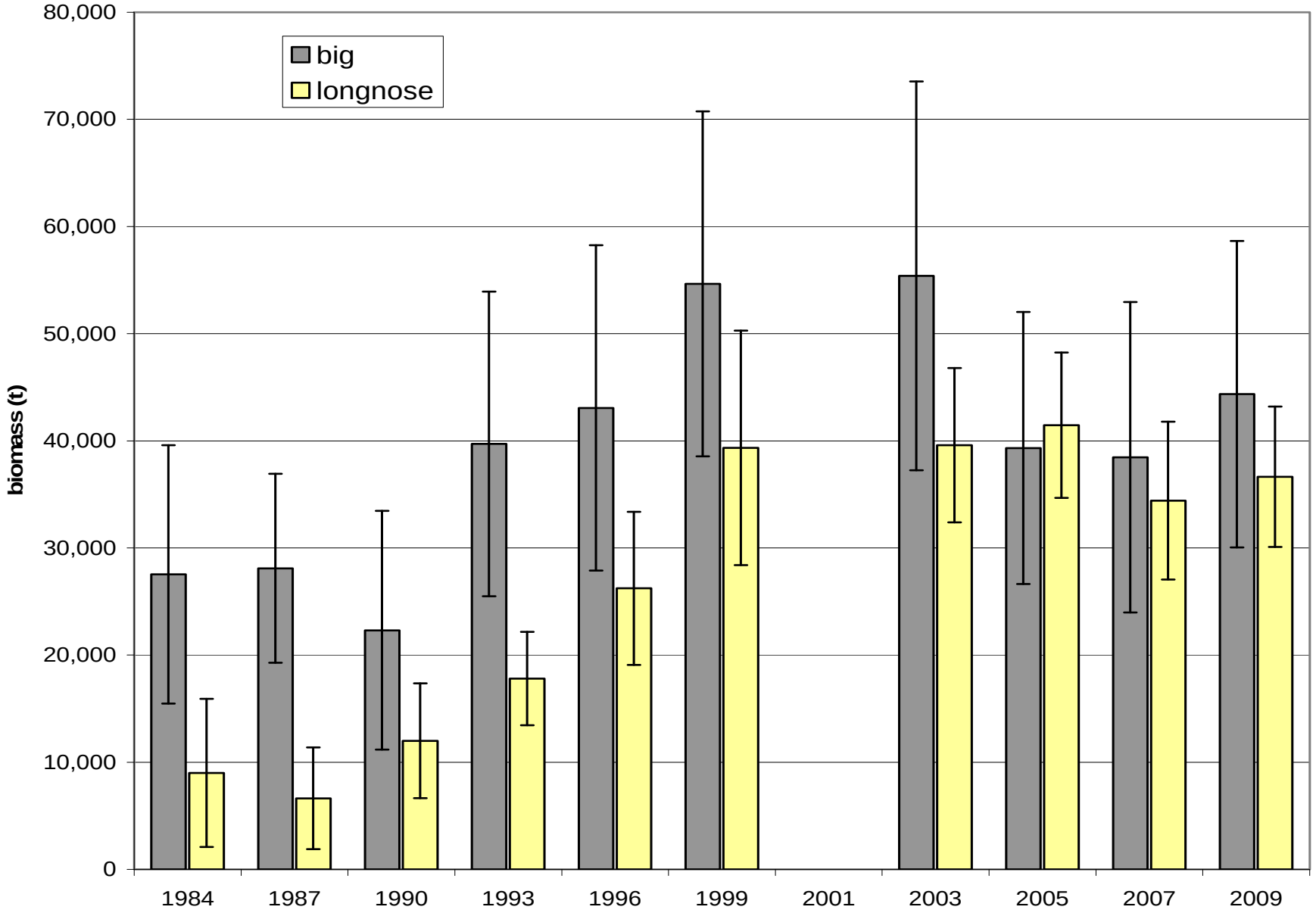
distribution-longnose skate



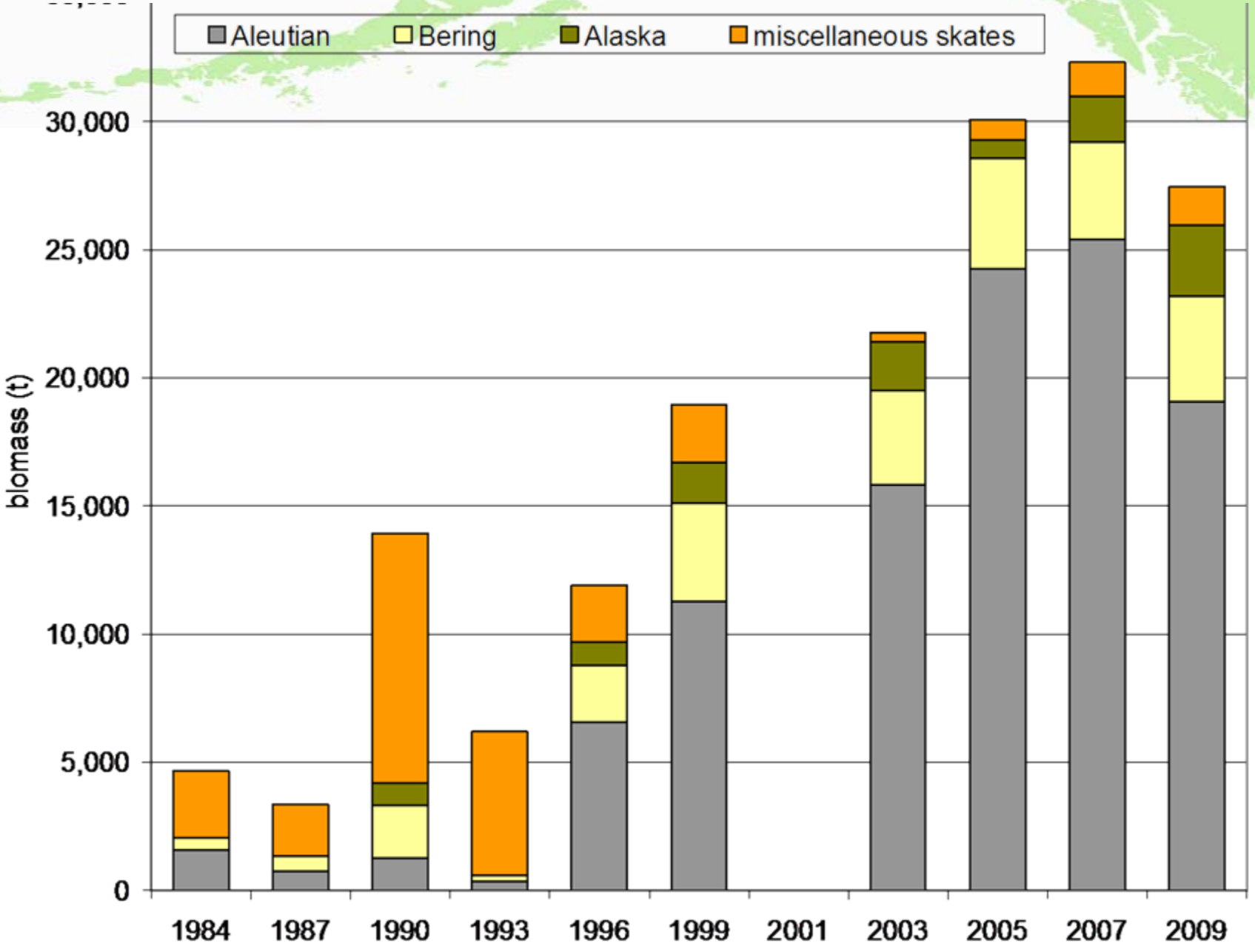
distribution-other skates



Skate survey biomass estimates-Big and Longnose



Other skates…



State waters skate fishery 2009

	Inside District	
	big	longnose
GHL lb	20,000	100,000
harvest lb	47,220	68,828
GHL t	9.1	45.4
harvest t	21.4	31.2
	Outside District	
	big	longnose
GHL lb	30,000	150,000
harvest lb	82,793	59,538
GHL t	13.6	68.0
harvest t	37.6	27.0

Skates ABC/OFL

Tier 5

Age-structured model may be available for Big and/or longnose skates next year

Big skates	Biomass	OFL	ABC
2010	44,381	4,438	3,328
2011		4,438	3,328

Longnose skates	Biomass	OFL	ABC
2010	38,031	3,803	2,852
2011		3,803	2,852

Other Skates	Biomass	OFL	ABC
2010	28,908	2,791	2,093
2011		2,791	2,093

18. Other species

- **Aggregate other species specifications for GOA**
  - Include: Squid, sharks, sculpins, octopus
  - Species-specific OFL and ABC recommendations summed for complex specifications
  - Possibility for individual species groups specifications in 2011 (w/ACL amendments)
  - PT encourages authors to coordinate efforts for estimation of incidental catch in halibut fishery

18a. GOA Squid

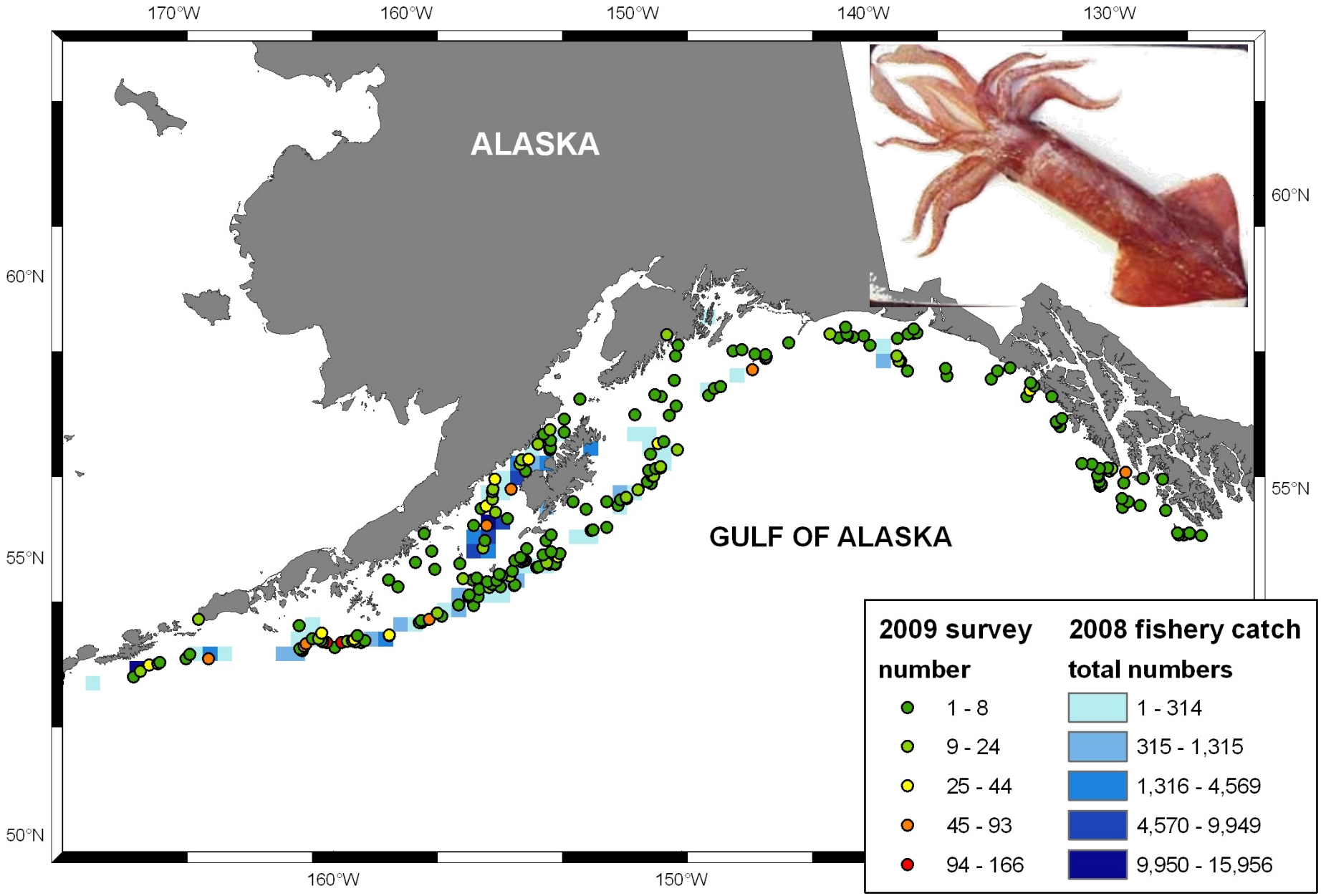
- **Biology**
  - Complex comprises many species
  - *Beryteuthis magister* dominant in bottom trawl survey
    - 98% in 2009
    - May be more vulnerable to BTS compared to other species
  - B. magister:
    - 2-year or 1-year life cycle (max. age 4 yrs.)
    - multiple cohorts within 1 year
    - patchy distribution

Summary p. 43, Chapter p. 1,245

GOA squid incidental catch: regions

Catch primarily in area 620

Squid survey and fishery distribution



18a. Squid

Alternative Tier 6

Use maximum historical catch level (1997-2007)

ABC setting process very tenuous due to abundance uncertainty

Squid	Biomass	OFL	ABC
2010	unknown	1,530	1,148
2011		1,530	1,148

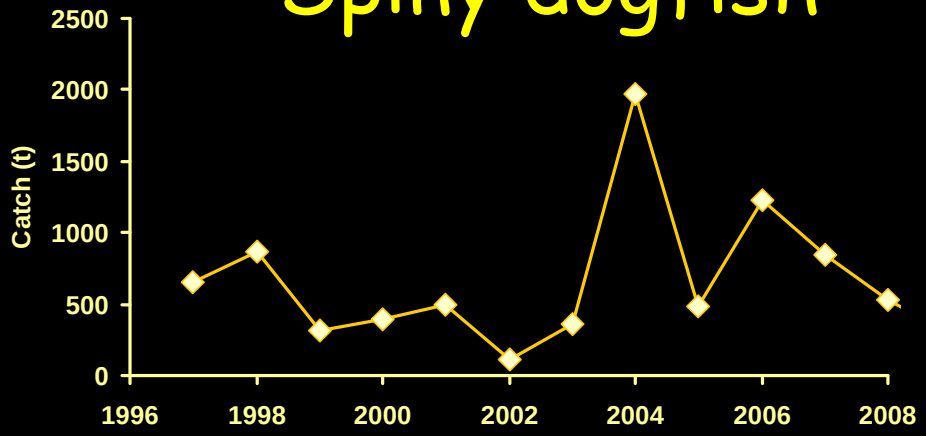
18b. GOA Sharks

- **New for 2009:**
  - Updated catch data for 2009 (as of Oct 7, 2009)
  - Total catch estimates revised from changes in CAS
  - Prelim estimates of bycatch in unobserved halibut fishery provided (but not included in ave catch calcs)
  - Biomass estimates for 2009 survey

Summary p. 44, Chapter p. 1,267

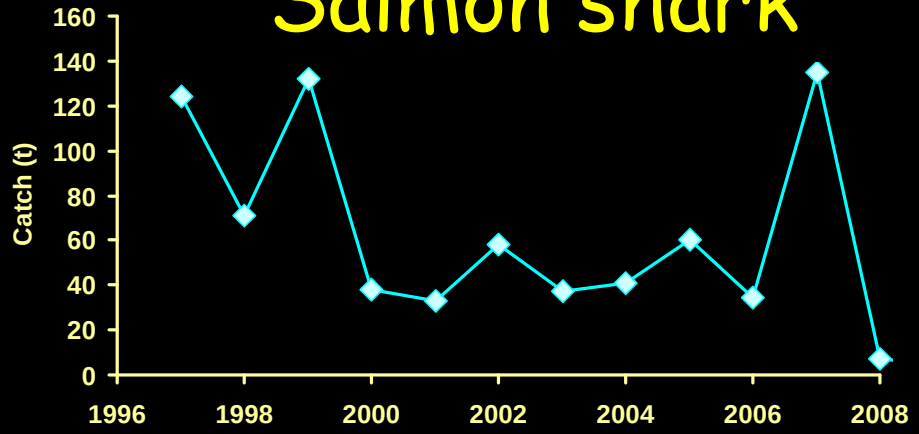
GOA Shark Catch

Spiny dogfish

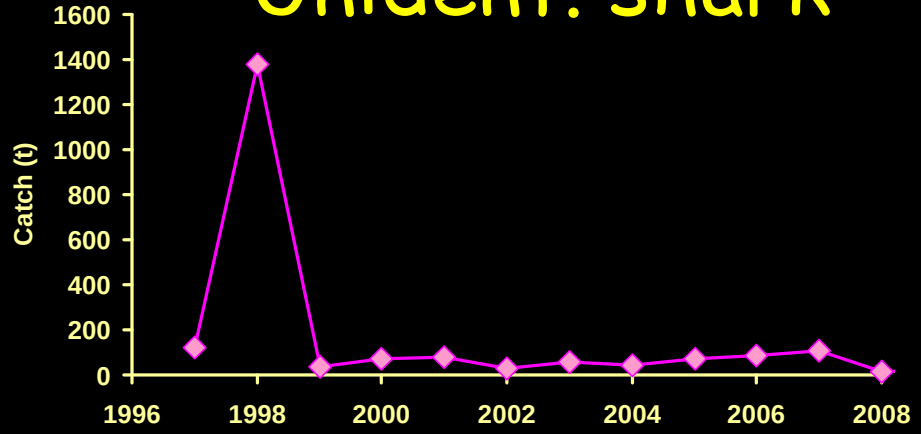


Sleeper

Salmon shark

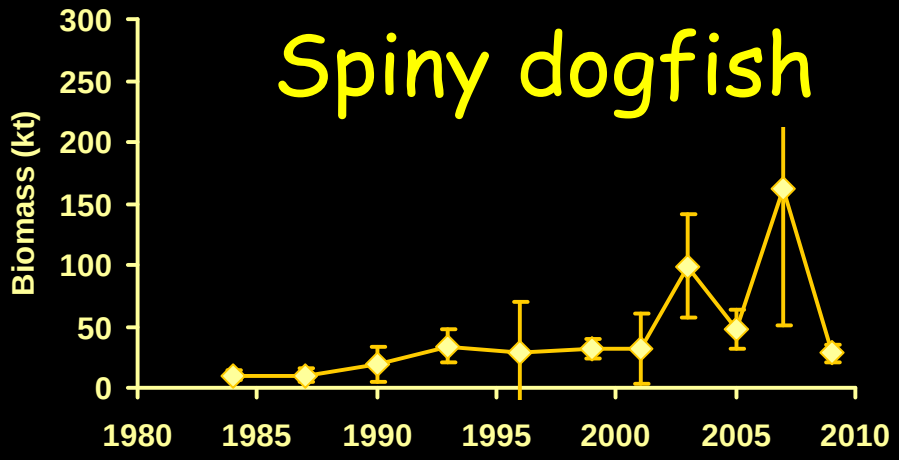


Unident. shark

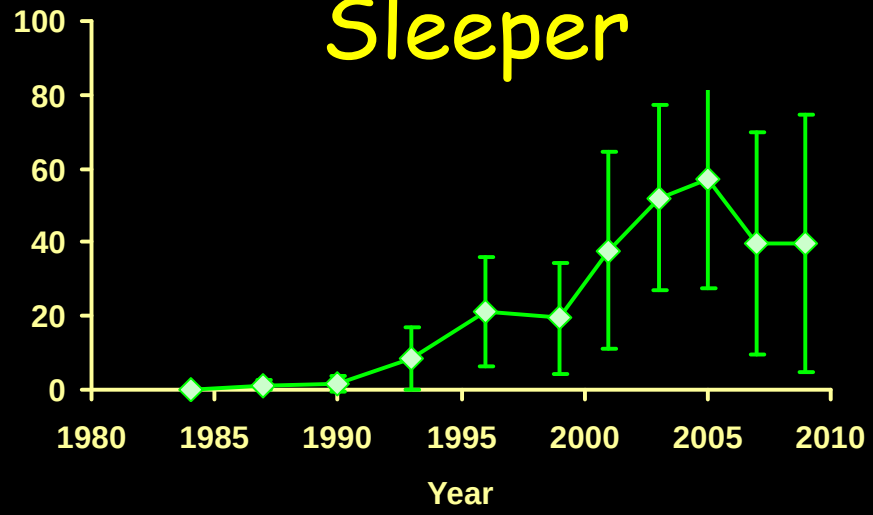


GOA Shark trawl survey biomass

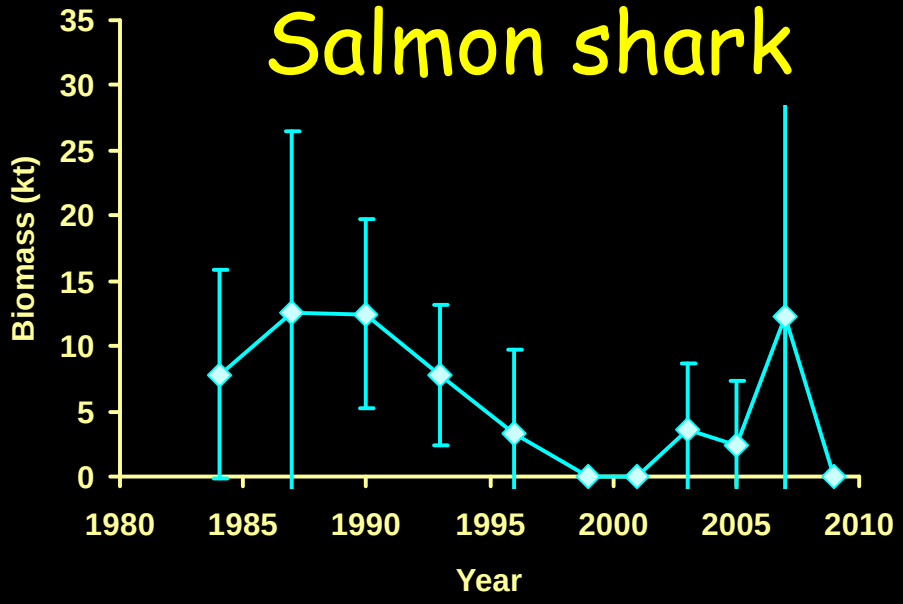
Spiny dogfish



Sleeper



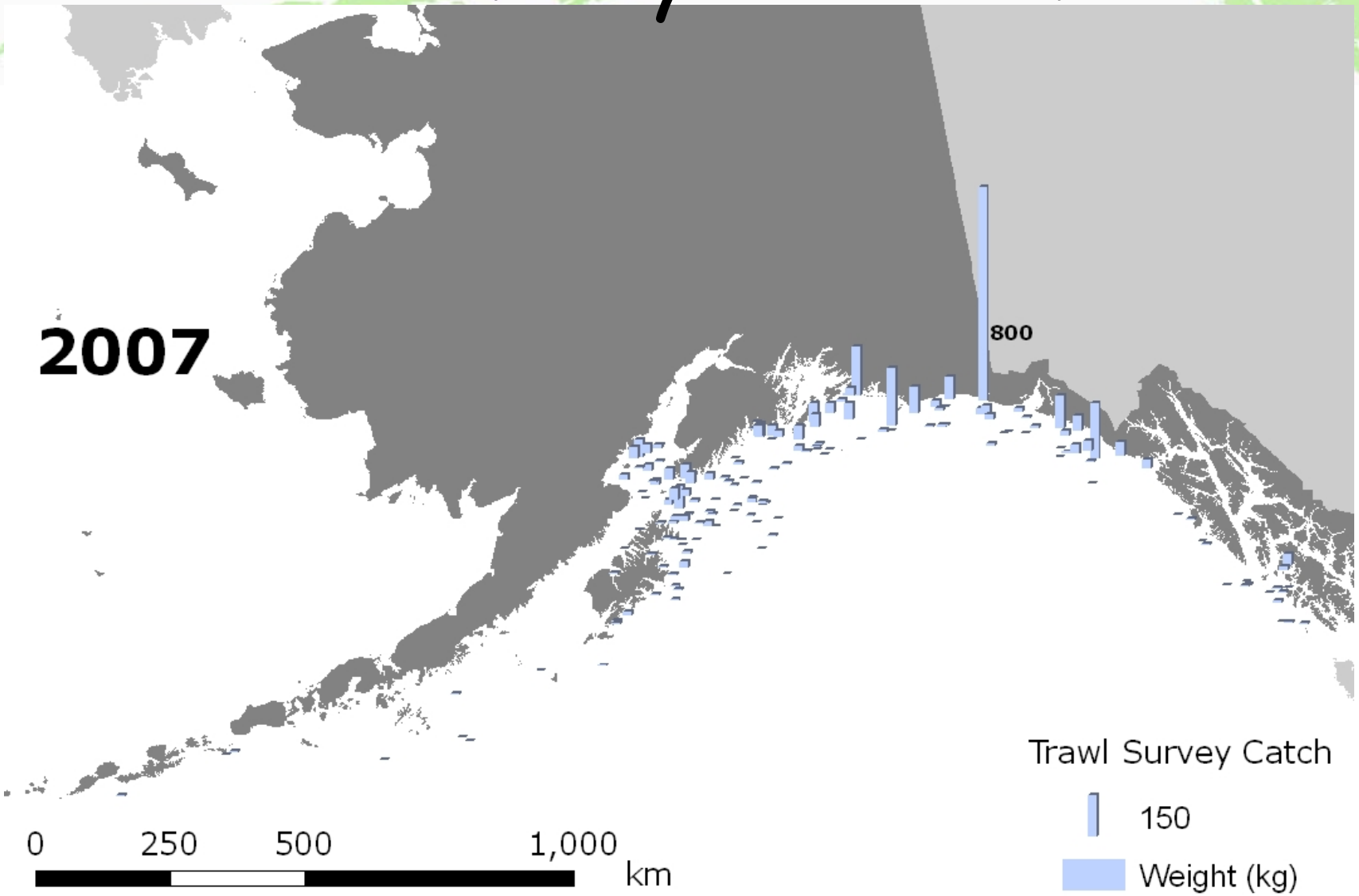
Salmon shark



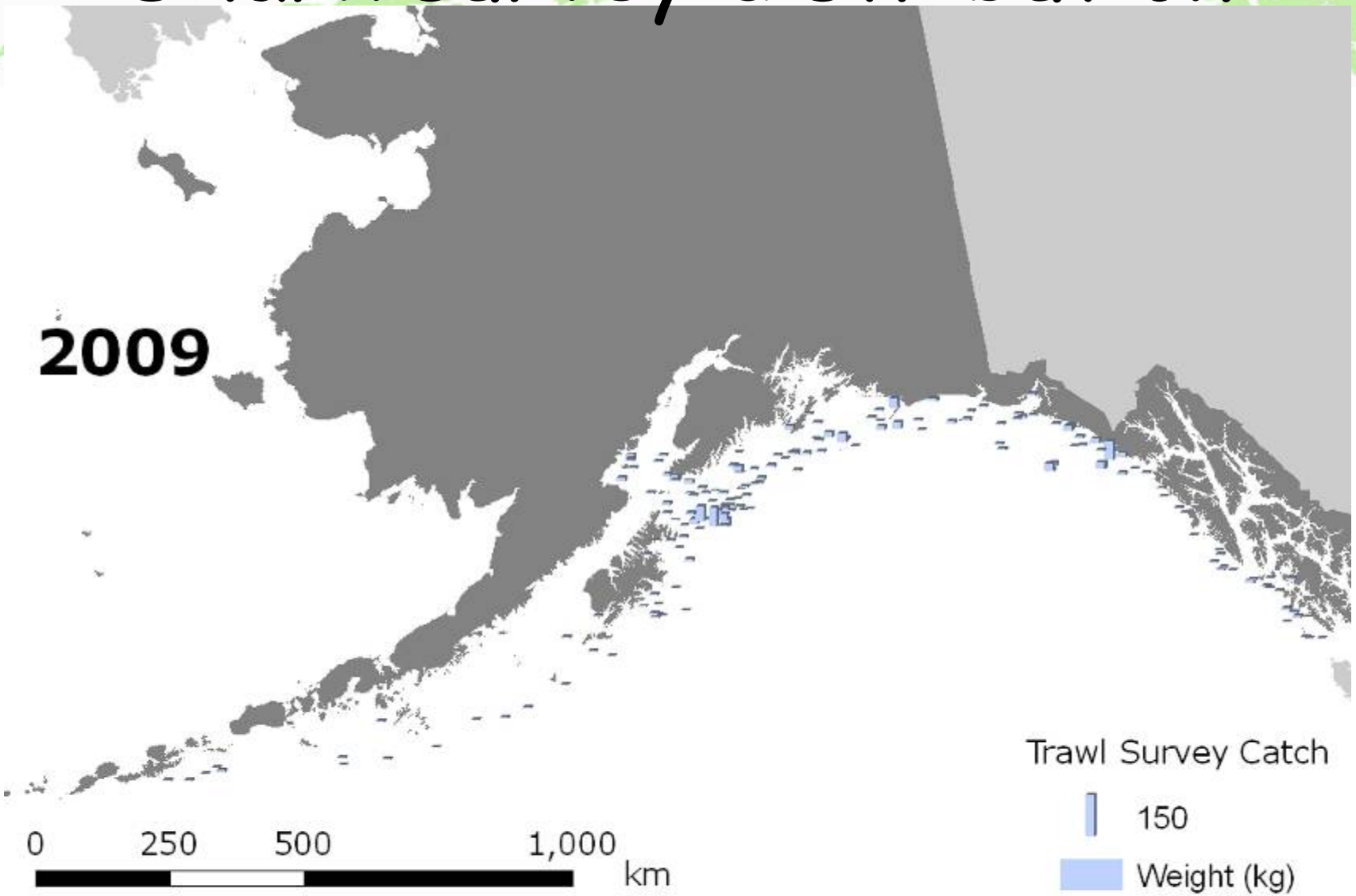
Unident. shark

Biomass estimates unavailable for other or unidentified sharks

Shark survey distribution



Shark survey distribution



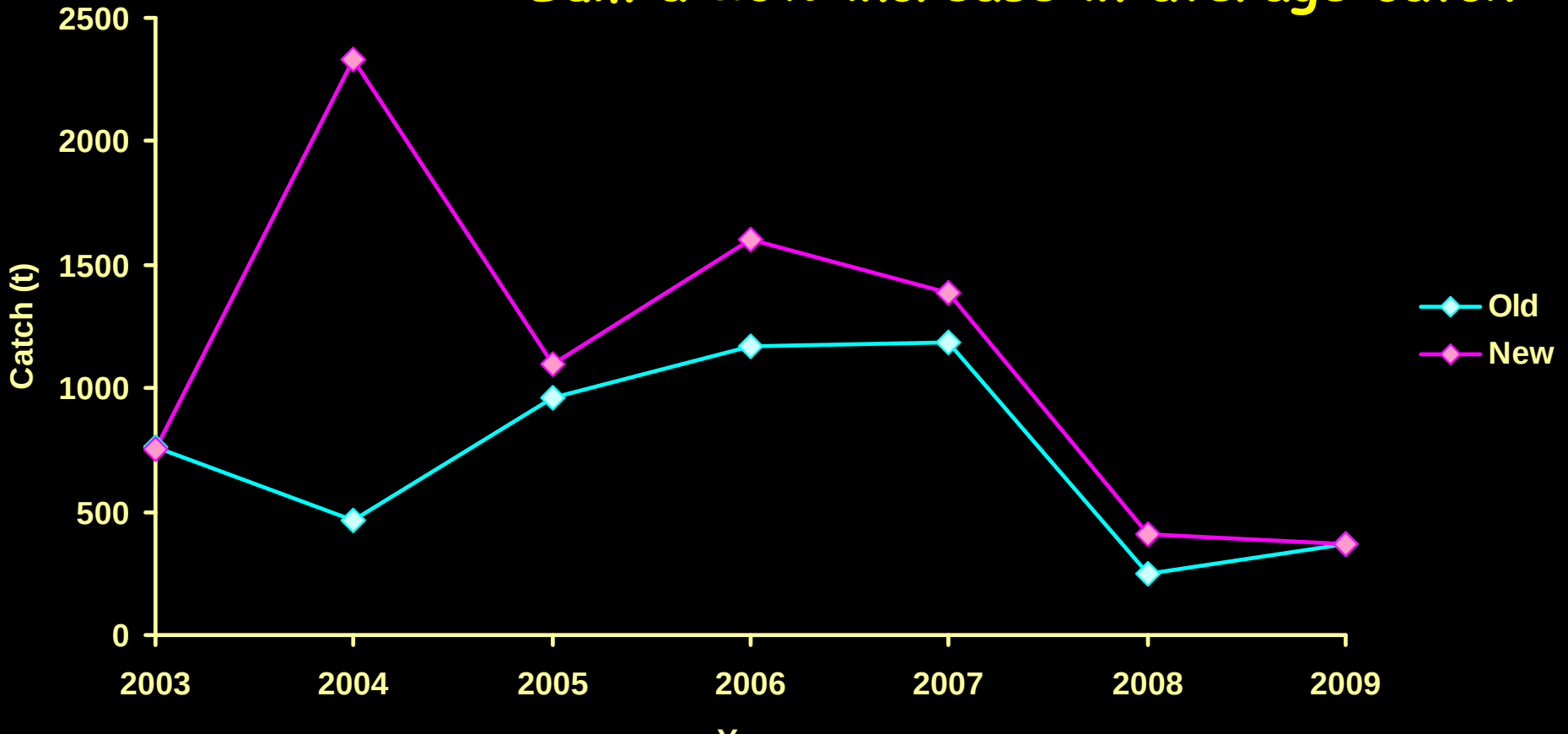
New shark catch time series

2003-2008 data updated

Changes in Catch Accounting System

Annual catches by species different

Sum a 23% increase in average catch

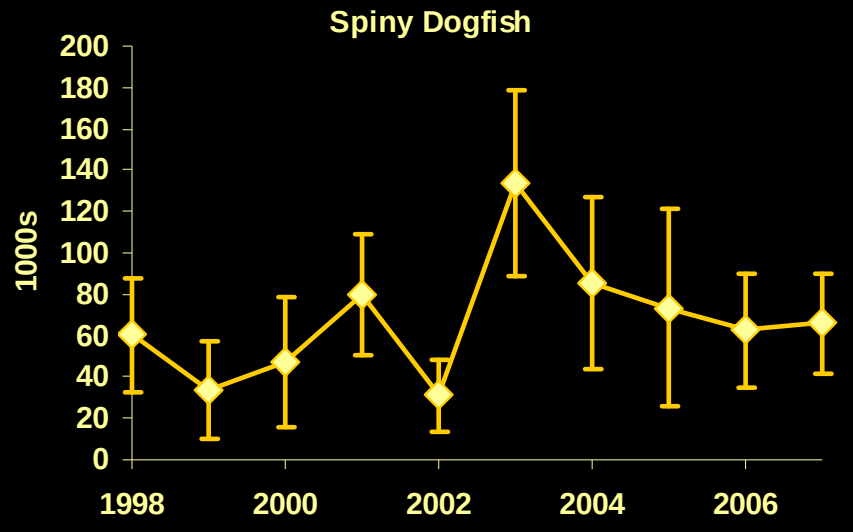


Shark bycatch in halibut fisheries

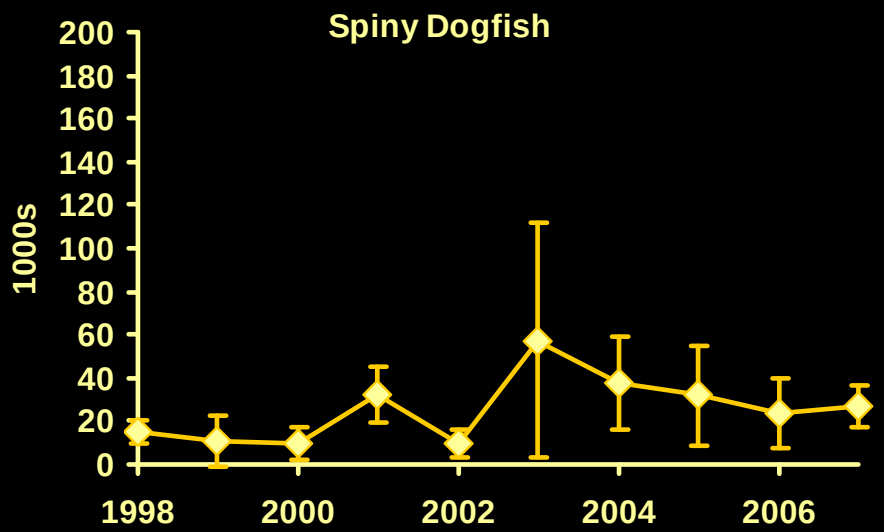
- **Preliminary estimates of bycatch from unobserved halibut fisheries**
- **Not included in ABC and OFL calculations**
- **CPUE method**

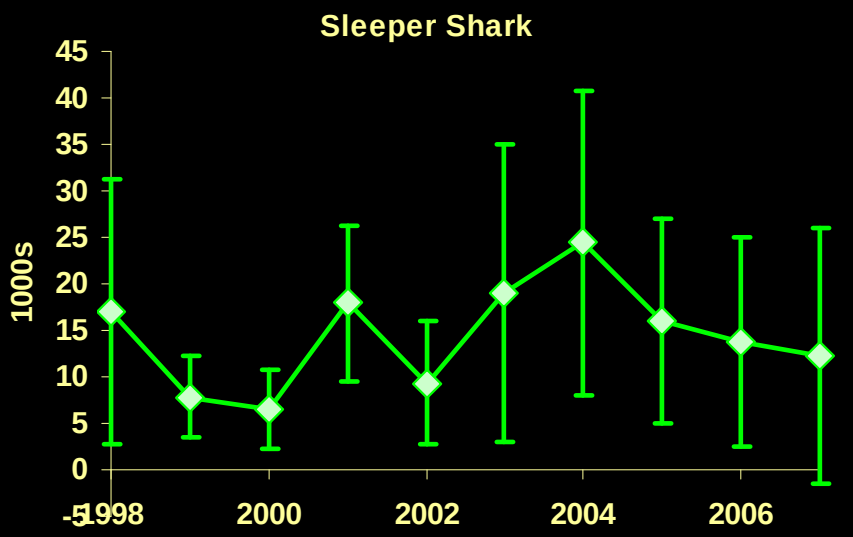
Shark bycatch in halibut fisheries

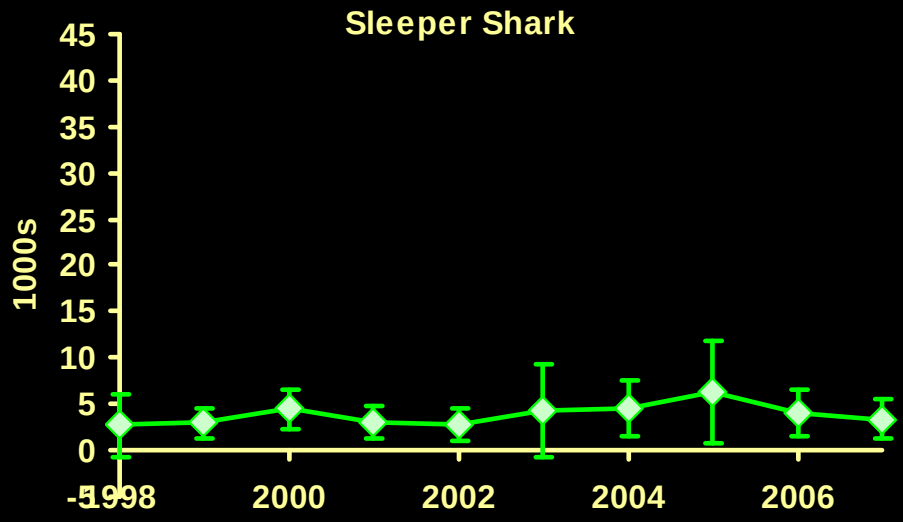
All survey data



Filtered survey data

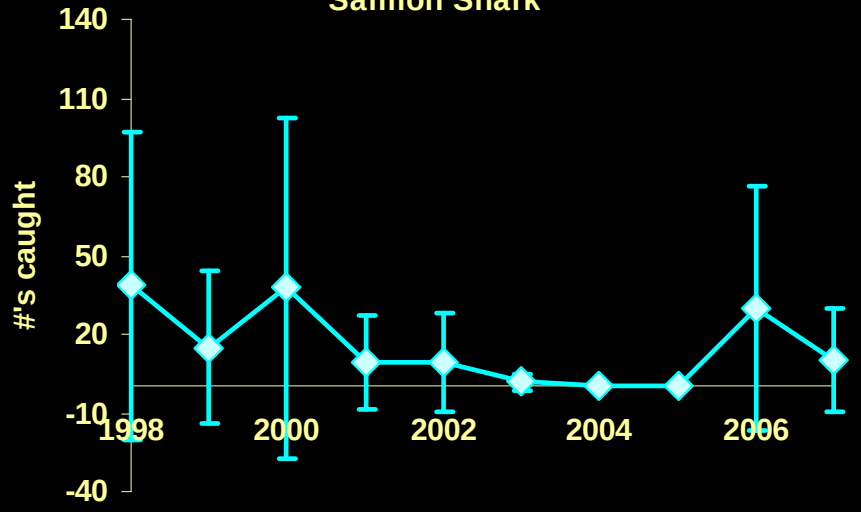




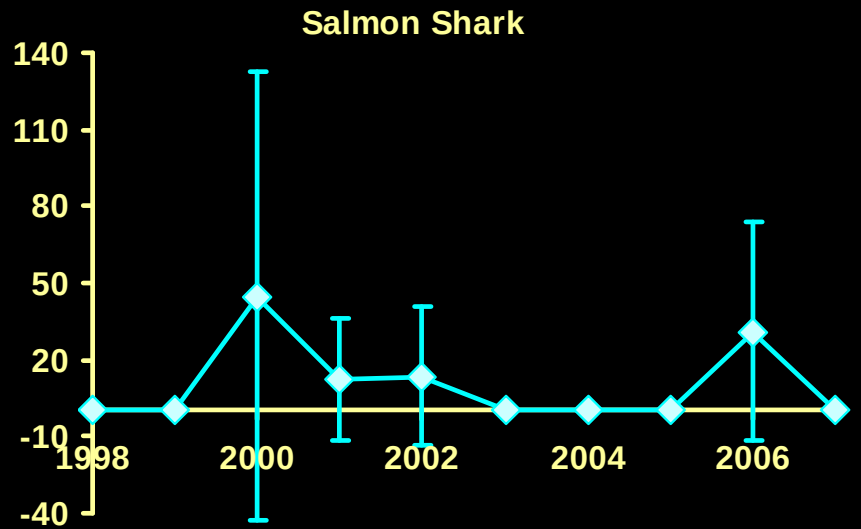


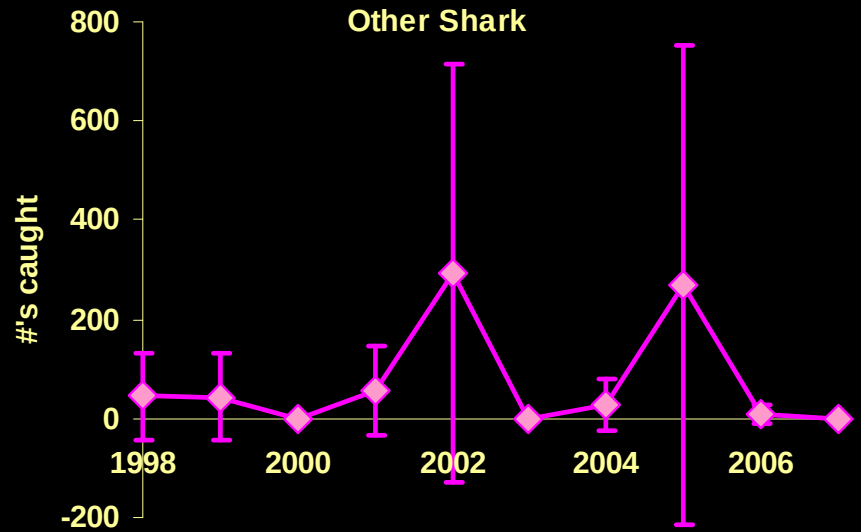
Bycatch in Halibut Fisheries

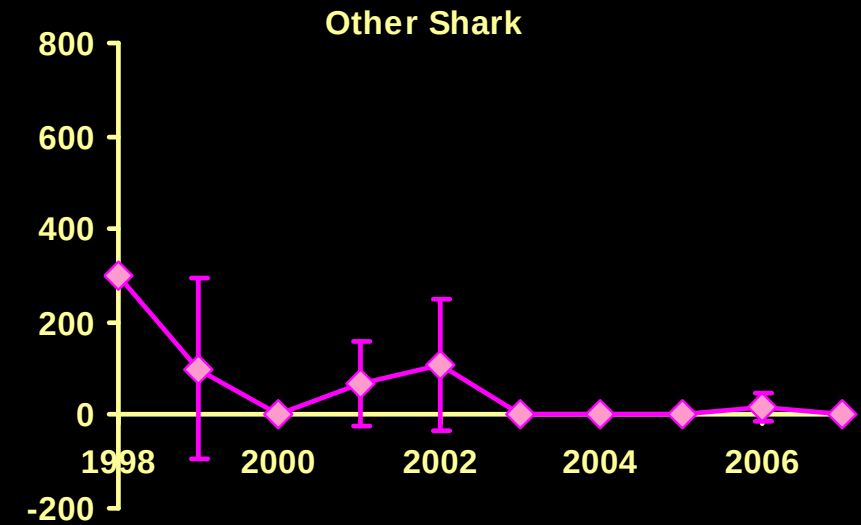
All survev data



Filtered survey data







GOA Sharks – 2010-2011 Tier 6

Species	Spiny dogfish	Pacific sleeper shark	Salmon shark	Unid-Other sharks	All Sharks
Tier	6	6	6	6	6
M	0.097	0.097	0.18	0.097	0.097
Average catch (t)	703	316	69	188	1,276
ABC (t)	528	237	52	141	957
OFL (t)	703	316	69	188	1,276

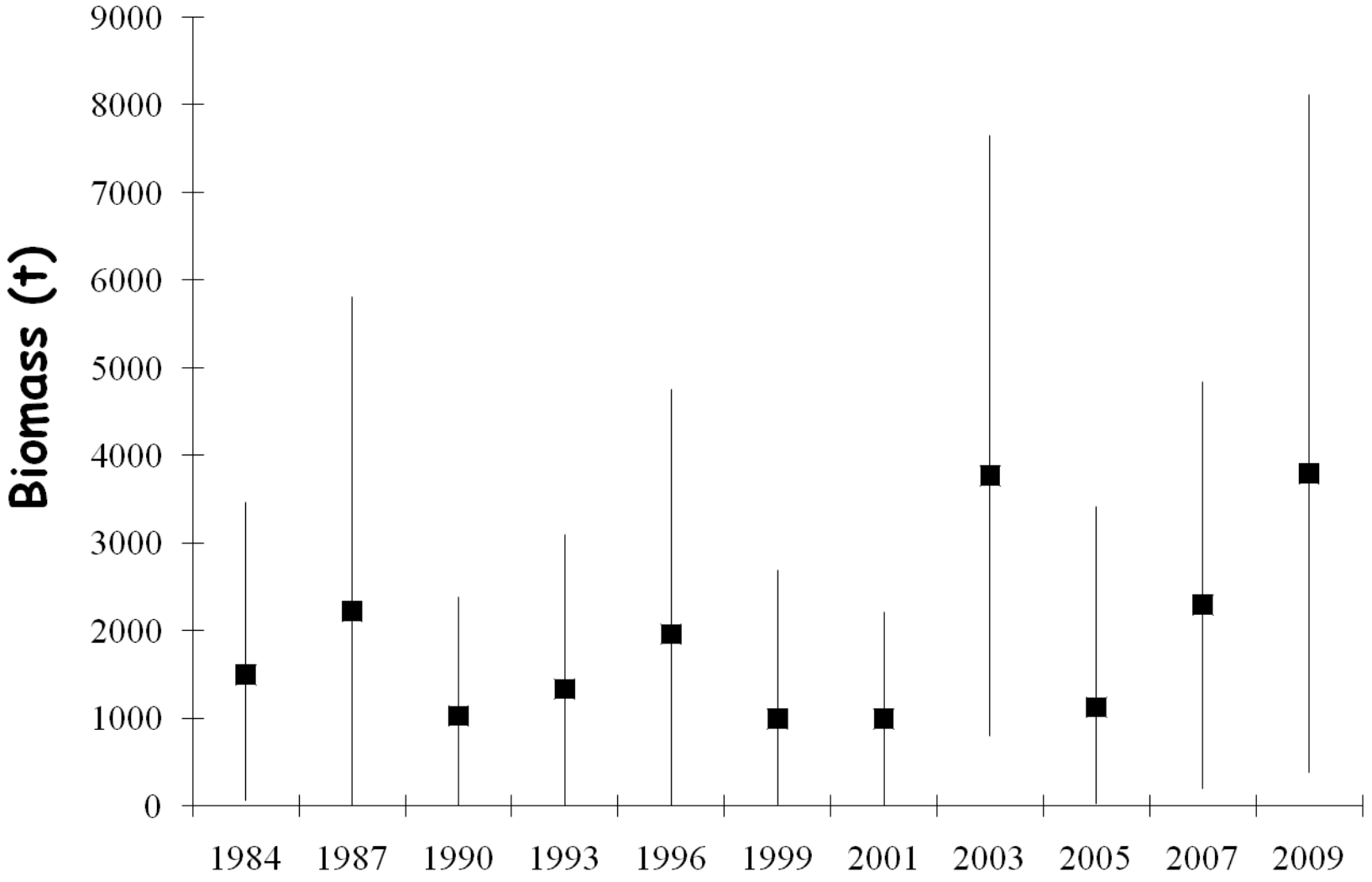
Average catch from 1997-2007 based on SSC previous recommendations

18c. Octopus

- **Survey biomass estimates available (1984-2009) but considered unreliable**
  - Octopus bottom trawl survey estimates questionable
- **Natural mortality rates also poorly estimated**

Summary p. 45, Chapter p. 1,325

GOA Octopus survey biomass



Octopus catch

	Target Fishery						
Year	Pcod	Pollock	Flatfish	Rockfish	Sable	Oth	Total
1997	194	1	1	2	22		232
1998	100	4	4	1	0		112
1999	163	0	2	0	0		166
2000	154	0	1	0	1		156
2001	72	0	1	0	2		88
2002	265	0	17	1	1		298
2003	189	0	17	1	3	0	210
2004	267	0	3	0	0	16	286
2005	141	0	8	0	0	2	151
2006	146	3	9	0	0	0	159
2007	248	1	11	0	2	0	263
2008	326	10	0	3	0	0	339
2009*	230	6	0	1	0	1	238

Incidental catch primarily (>85%) from pot gear

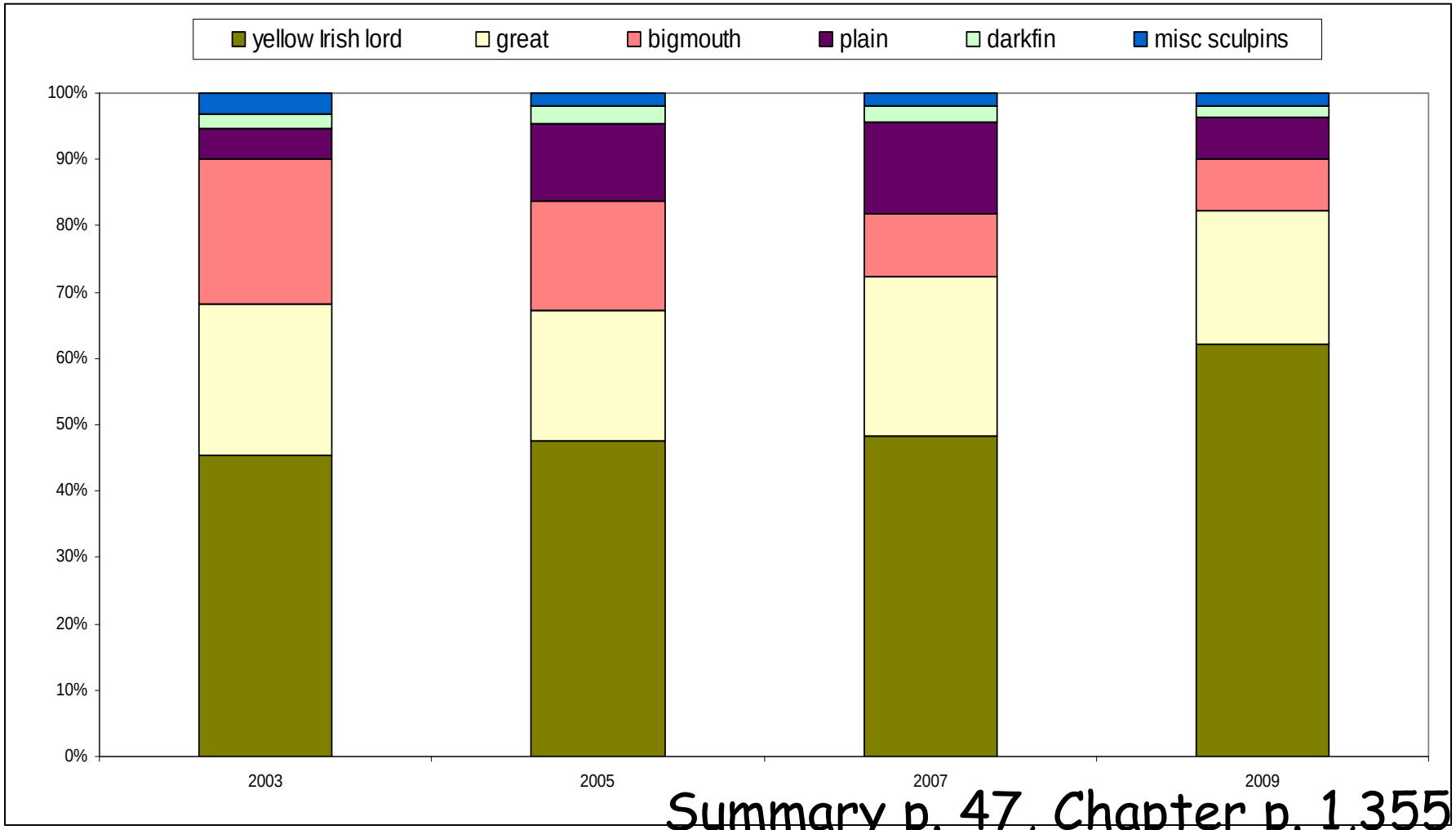
Octopus

- **Alternative Tier 6**
  - Maximum historical catch (1997-2007)
  - 2008 had highest catch year
- **Desire to explore alternative management**
  - Tier system may be inappropriate
- **Candidate for EC?**
  - May fail on criterion that "not generally be retained for sale or personal use"

	Biomass	OFL	ABC
2010	Unknown	298	224
2011		298	224

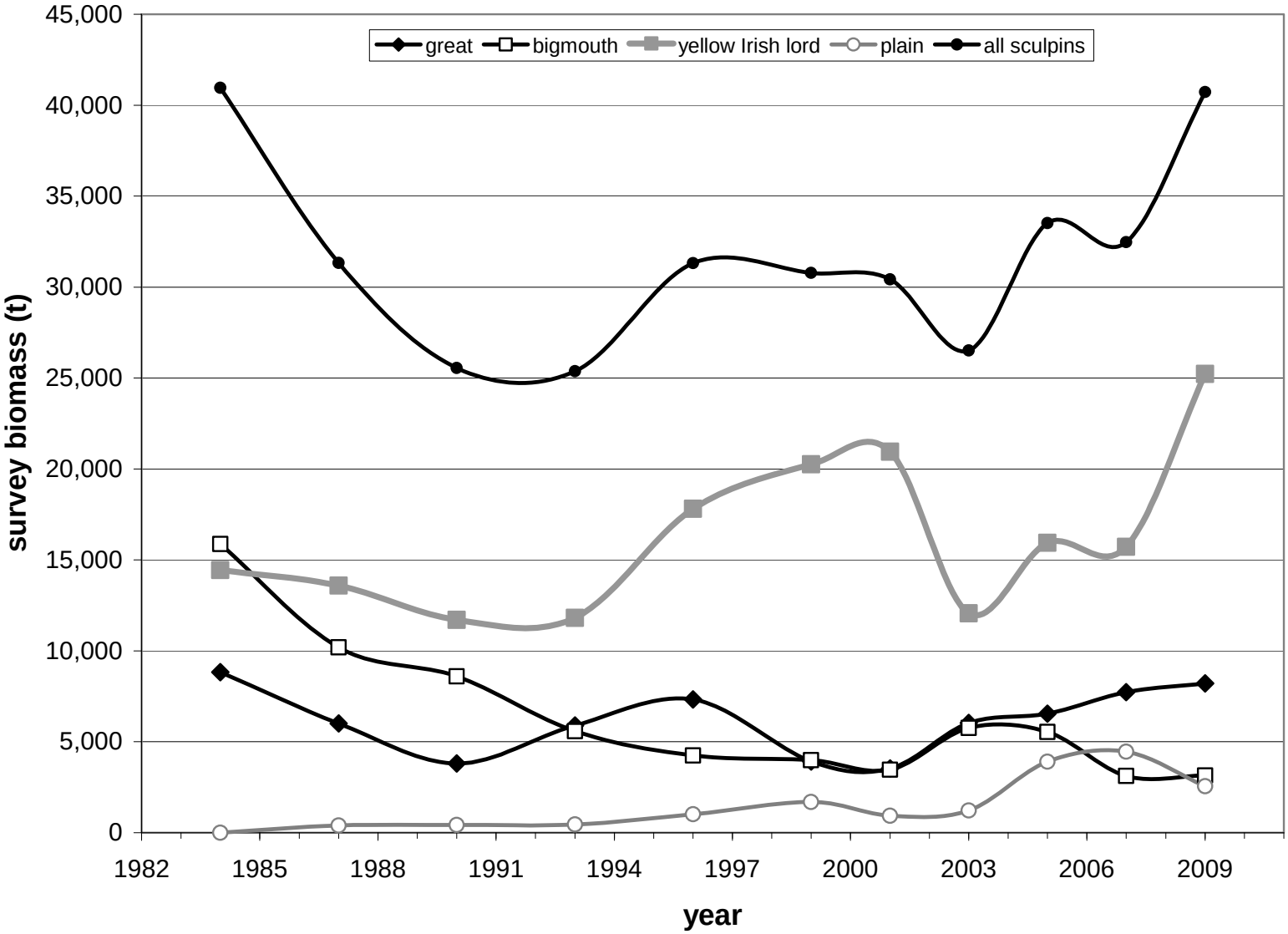
18d. GOA Sculpins

- 95% of aggregate sculpin biomass dominated by larger sculpin species
- 2009 survey (40,727 t) increase from 2007 estimate (32,362 t)
- Increase primarily in biomass of yellow Irish lord (62% of biomass estimate)



Summary p. 47, Chapter p. 1,355

18d. GOA Sculpins, abundance trends



GOA Sculpins specifications

- **Tier 5 based on average biomass from last 4 surveys**

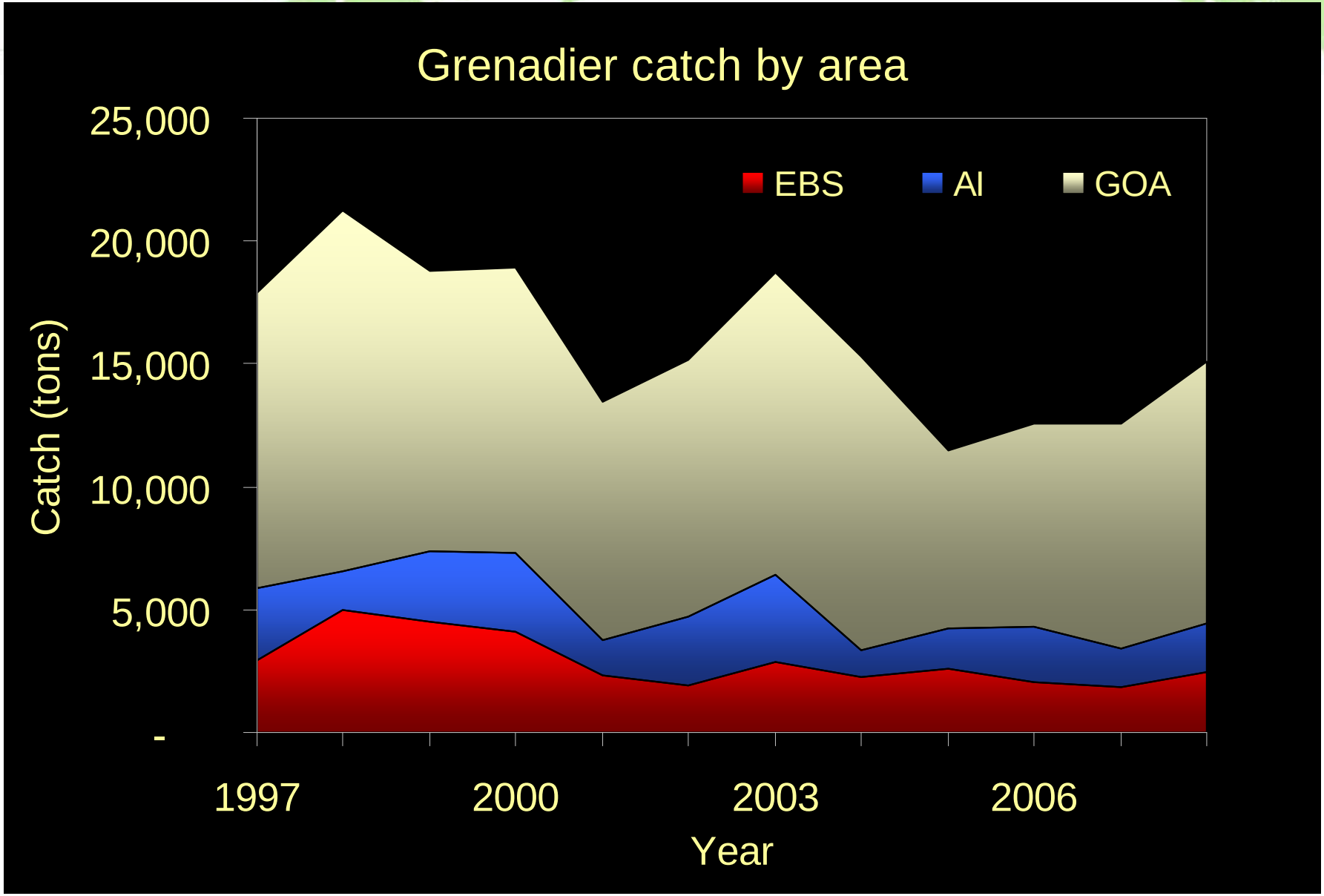
Sculpins	Biomass	OFL	ABC
2010	33,307	6,328	4,746
2011		6,328	4,746

Appendix: Grenadiers

- **"Nonspecified" by NPFMC, (not part of FMPs) so assessment not officially required**
- **Giant grenadier by far the dominant species;**
  - Pacific & popeye grenadier much less important
- **In assessments, giant grenadier is proxy for group**

Summary p. 48, Chapter p. 1,373

Appendix: Grenadiers



Appendix: Grenadiers

- **Plan Team recommendations**
  - Tier 5 seems reasonable given reliable biomass estimates from the trawl surveys
  - Both Teams recommend moving back into the FMP for management purposes
  - Information on giant grenadiers (including technique to assess age-structure) could allow for moving up in Tier level in the future

Halibut discard mortality rates

Revised 10 year average rates (3 year revision cycle)

New rates recommended for 2010-2012

- Represent relatively minor updates

Summary p. 49, Chapter p. 1,377

Gear/Target	Gulf of Alaska: Used in 2007-2009	Gulf of Alaska: 2010-2012 Recommendation
Trawl		
Bottom poll	59	59
Pacific cod	63	62
Dpwtr flats	53	48
Shallwtr flats	71	71
Rockfish	67	67
Flathead sole	61	65
Midwtr poll	76	76
Sablefish	65	65
Arr. fldr	69	72
Rex sole	63	64
Pot		
Pacific cod	16	17
Longline		
Pacific cod	14	12
Rockfish	10	9

Appendix: GOA forage fish

- **Executive summary (only) in survey years**
- **Likely candidate for EC group**
- **Future: GOA IERP**
  - Will provide additional information
  - May result in better assessment of forage fish