

Economic Impacts of Reducing BSAI Halibut PSC Limits

Presentation to the

North Pacific Fishery Management Council

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June 4, 2015



Presentation Outline

- Highlight changes in the RIR
- General assumptions about the IMS model
- Impacts for groundfish
- Response to reduced PSC limits
- Impacts in yield to halibut fishery

Changes to the RIR in Chapter 4

- **Clarified assumptions in the model**
 - Methodology in 4.6 (p 228), assumptions in 4.6.3 (p 265)
- **Assessment of impacts aggregated over all percentage reduction options, details moved to Appendix D**
- **Average annual future revenues reported, as well as 10 year sum**
- **Enhanced discussion of groundfish impacts**
 - Estimates of crew member involvement & impacts (4.4 & 4.8–4.12)
 - Implications of PSC Reductions on Optimum Yield (4.8–4.12)
 - Catch progressions lines comparing wholesale revenues and halibut PSC by sector and target fishery in existing conditions sections and in impacts section (4.4.2–4.4.6 & 4.8-4.12)
 - Improved discussions of behavioral changes (4.8–4.12 & Appx B)

Changes to the RIR in Chapter 4

- **Halibut fishery impacts by sector and across**
 - Changes in the process to estimate FCEYs & harvest
- **Explicit modeling of U26 impacts coastwide**
 - Methods described in 4.6.1.2, beginning p. 236
 - Impacts summarized for: 1) Area 4 (BSAI), 2) GOA (Other AK), 3) BC and US West Coast (External Areas)
- **Community analysis for groundfish and BSAI halibut communities**
 - Appendix C, and summarized in 4.13

General assumptions regarding the IMS Model

1. **Impacts of limit reductions can be modelled using 2008–2013 as basis years to represent future years from 2014 to 2023; initial PSC cuts occur in 2014, and initial halibut increases in 2015**
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- **Using 2008 – 2013 as the basis years implies that for groundfish, all ABCs, TACs, PSC limits and apportionments, harvests, prices and revenues (both ex-vessel and wholesale) can be used to represent the future under the status quo**
 - **With reductions in groundfish harvests to comply with new PSC limits the basis year can also represent future years under the “change case”**
 - **“Impacts” of the proposed PSC Limit reductions are calculated as the difference between the status quo and the change case**

General assumptions regarding the IMS Model

- 2. Future halibut biomass is fixed at 2014 IPHC levels with future fishery yield increases resulting from changes in PSC, augmented with yield increases from U26 savings. Other yield factors held constant.**
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- For purposes of the model only, biomass is assumed to remain constant in future. This allows the analysis to focus on the changes specific to PSC reductions.**
- The model applies what would approximate the IPHC blue line yield recommendations. Because of the retrospective bias adjustments, these are different than existing conditions—IPHC is not bound by the blue line, and in 2014 & 2015, they exceeded it.**
- IMS Model use of the “Blue Line” can result in negative FCEYs**

Future Initial Area Specific Yield and Fishery Yields under the Status Quo in the IMS Model

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
IPHC Area	Initial Area Specific Yield in net weight mt									
4A	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093	1,093
4B	783	783	783	783	783	783	783	783	783	783
4CDE	1,305	1,305	1,305	1,305	1,305	1,305	1,305	1,305	1,305	1,305
Area 4 Total	3,181	3,181	3,181	3,181	3,181	3,181	3,181	3,181	3,181	3,181
	Average Annual Fishery Constant Exploitation Yield (FCEY) in net weight mt									
4A	767.0	712.2	743.4	744.4	738.9	739.3	736.2	737.1	738.3	737.6
4B	639.9	657.8	657.2	654.3	653.3	652.6	652.5	653.6	653.6	639.9
4CDE	-87.1	99.9	155.2	148.6	148.1	146.8	140.3	144.3	145.1	143.6
Area 4 Total	1,404	1,452	1,556	1,550	1,541	1,539	1,529	1,534	1,537	1,534
	Number of Occurrences in the 10,000 Model Iterations									
4CDE FCEY Less than 0 mt	10,000	1,639	1,142	1,128	1,090	1,116	1,133	1,076	1,073	1,094

See Table 4-123 on page 274.

General assumptions regarding the IMS Model

3. **Future groundfish PSC, harvest, and revenue in the status quo and the change case use a random selection (with replacement) of basis years with reductions imposed only if PSC exceeds the new limit in the base year; noting that PSC is independent of biomass, and that the same basis years are used for both the SQ and change cases**
 - Tables prepared for each sector indicate the basis years in which the PSC reduction affects harvest and how much PSC will be reduced in that year
 - Similar tables show how much wholesale revenue is reduced in each basis year

4. **10,000 independent iterations are run for each of two scenarios (A & B) for each reduction sub-option. Scenario A is a lower impact case than Scenario B, noting that scenarios are mutually independent**

Table 4-126. Halibut PSC Cuts in Each Basis Year from A80-CP Target Fisheries, by Suboption and Scenario (p. 285)

		2008	2009	2010	2011	2012	2013
Alternative	Scenario	mt Halibut PSC Cut in Each Basis Year					
Status Quo	Scenario A	-	-	-	-	-	-
	Scenario B	-	-	33	-	-	-
1a: -10%	Scenario A	-	-	163	-	-	78
	Scenario B	-	57	204	-	-	126
1b: -20%	Scenario A	111	224	419	-	89	310
	Scenario B	168	249	429	-	137	349
1c: -30%	Scenario A	342	448	627	197	318	555
	Scenario B	397	495	640	197	353	561
1d: -35%	Scenario A	462	578	743	309	437	667
	Scenario B	501	613	786	351	473	683
1e: -40%	Scenario A	581	679	860	431	555	774
	Scenario B	613	699	898	449	569	789
1f: -45%	Scenario A	693	811	986	534	669	890
	Scenario B	712	808	1,000	584	681	907
1g: -50%	Scenario A	807	911	1,093	648	799	1,007
	Scenario B	840	926	1,114	674	799	1,041

Table 4-160. Halibut PSC Cuts in Each Basis Year from LGL-CP Target Fisheries, by Suboption and Scenario (p. 327)

		2008	2009	2010	2011	2012	2013
Alternative	Scenario	mt Halibut PSC Cut in Each Basis Year					
Status Quo	Scenario A	-	-	-	-	-	-
	Scenario B	-	-	-	-	-	-
1a: -10%	Scenario A	-	-	-	-	-	-
	Scenario B	-	-	-	-	-	-
1b: -20%	Scenario A	-	-	-	-	-	-
	Scenario B	-	-	-	-	-	-
1c: -30%	Scenario A	34	30	-	-	19	-
	Scenario B	66	38	-	-	46	-
1d: -35%	Scenario A	75	63	-	-	56	-
	Scenario B	91	76	23	-	86	-
1e: -40%	Scenario A	110	101	34	23	94	3
	Scenario B	125	122	54	49	107	19
1f: -45%	Scenario A	147	141	72	60	138	40
	Scenario B	162	160	99	77	152	57
1g: -50%	Scenario A	186	184	110	97	170	79
	Scenario B	205	202	123	113	185	93

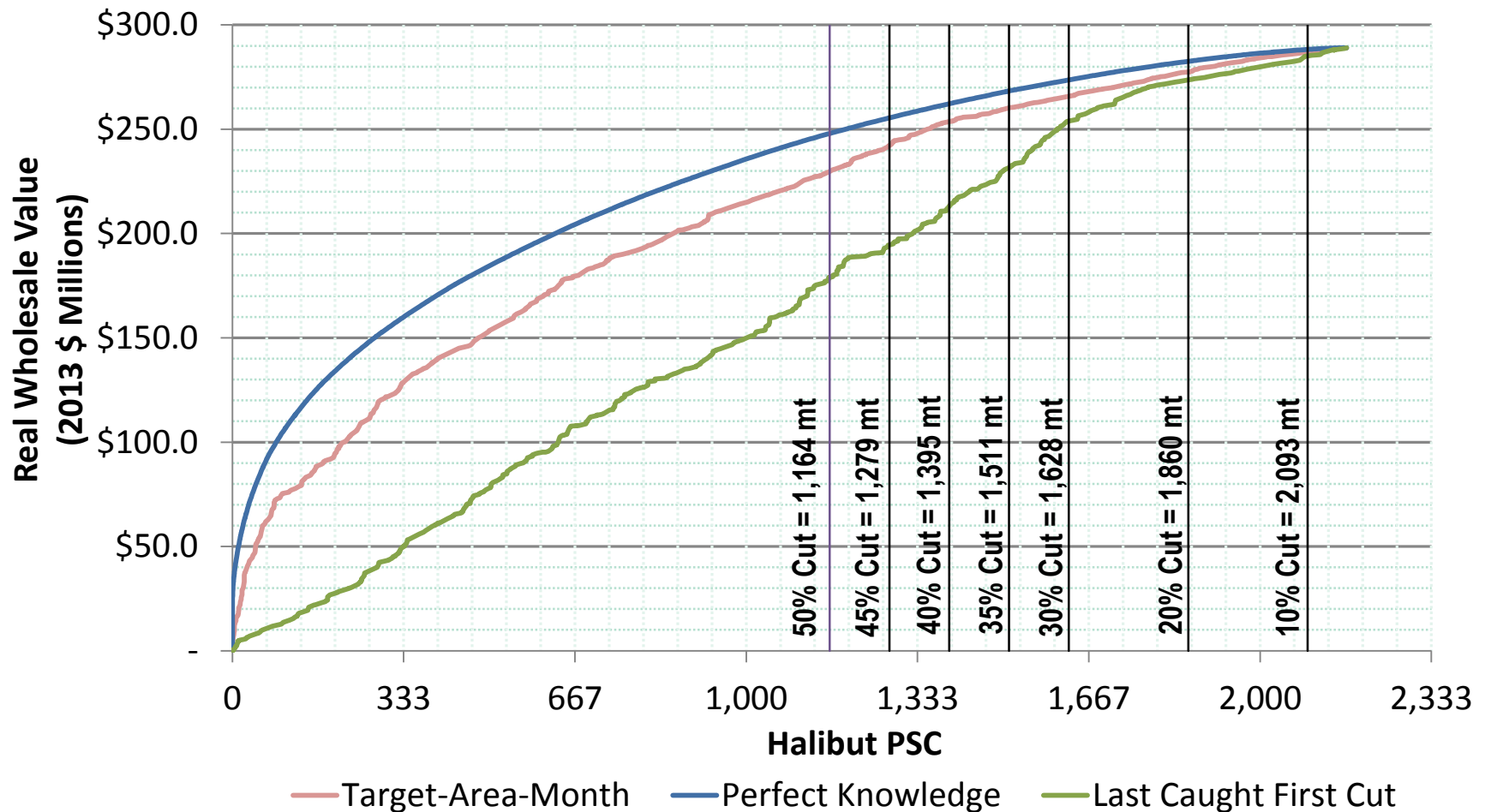
Impacts for Groundfish Fisheries

- The “Super Summary” table in the executive summary (p. 22 and also in Section 4.13 on p. 359) contains all of these results.
 - Tables in the impacts section for each sector also report these outcomes
- Amendment 80 (Option 1) and BSAI TLA (Option 2): all PSC options would have been constraining in some of the years 2008-2013, and are likely to be constraining in some future years
- Pacific cod longline CPs (Option 3): only reductions of 30% or higher would be likely to constrain the fishery in the future
- Pacific cod longline CVs (Option 5) and Other longline fisheries (Option 4) would not be affected by any of the reduction options
- CDQ groups (Option 6): only reductions of 35% or higher would be likely to constrain the CDQ groundfish fishery in the future, unless growth continues at its current rate

Impacts to Amendment 80 Cooperative Fisheries

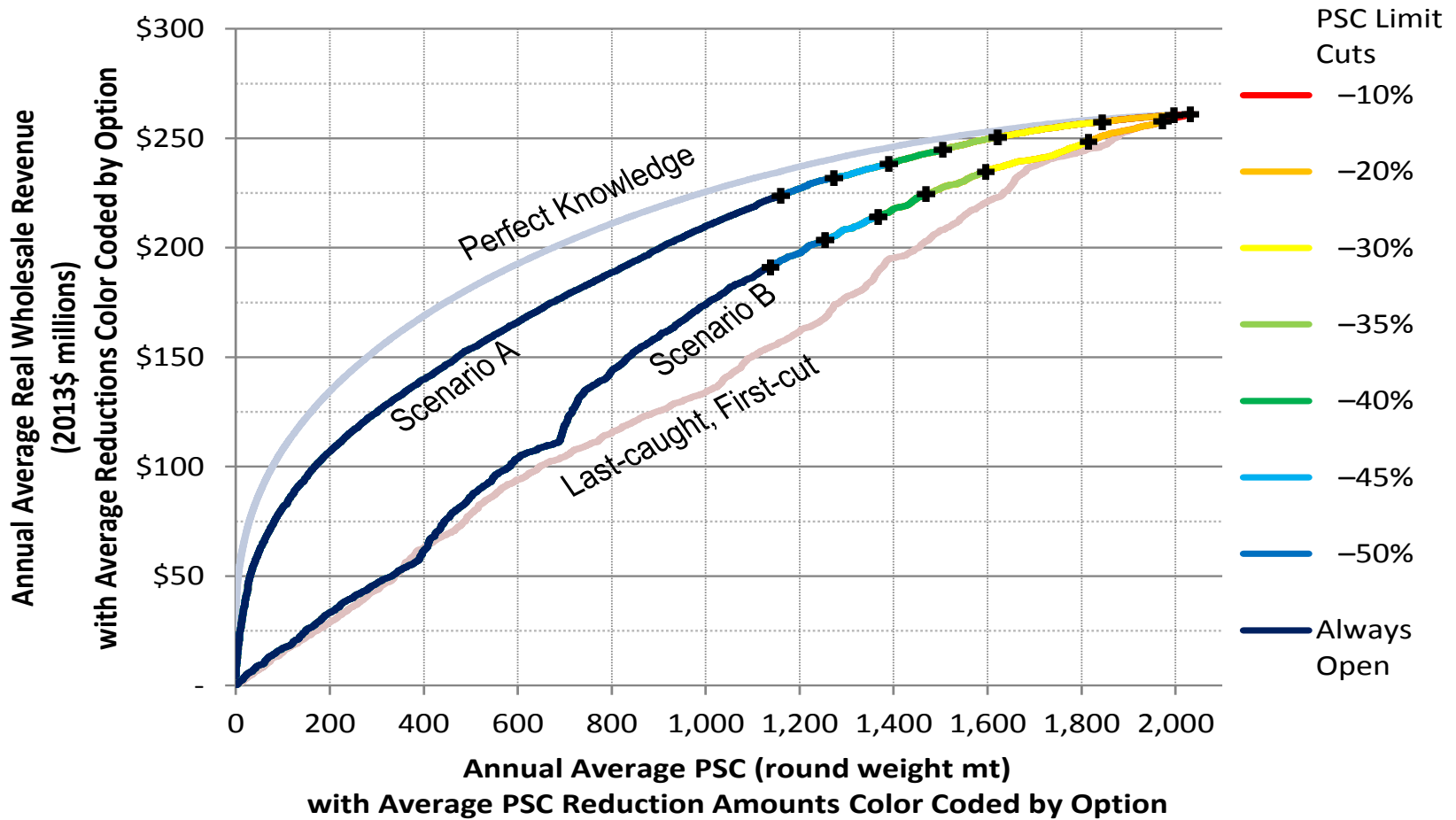
- **Scenario A** assumes they use historic fleet-wide data from the basis years, to determine collectively which fisheries (by target, month and management area) must be off limits. We assume strict compliance and that there are no barriers that limit transfers of PSC and groundfish among or across cooperatives
- **Scenario B** assumes there is some friction in PSC transfers—each company retains up to five percent more PSC than they need as a buffer for unexpected bycatch events. Each company has their own limit and each make individual decisions based on company data to determine the months that all of the companies' vessels will operate. No assumptions are made regarding the de-activation of individual vessels.
 - Two other methodologies, last-caught-first-cut and perfect knowledge, are estimated, but not used because the analysts felt they were less likely for A80 vessels. The analysts recognize that other strategies to mitigate impacts of PSC limit reductions could be employed by the A80 fleet.

Example catch progression lines for A80-CPs for basis year 2013



See Figure 4-63 on page 255

Impacts on A80-CPs based on average annual values (p. 288) – numbers in Table 4-127 p. 286

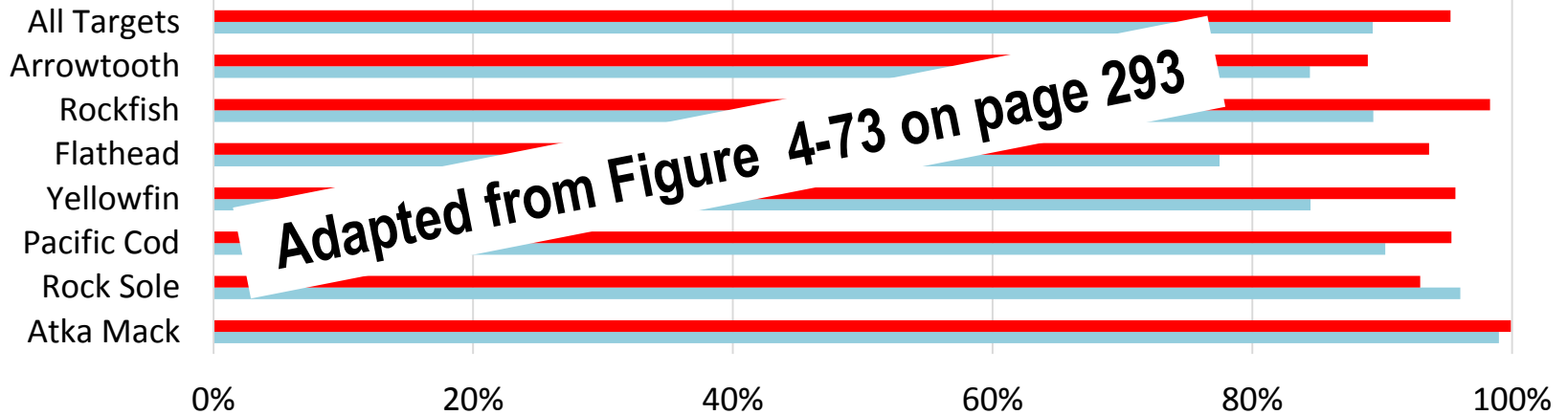


Impacts to A80 CPs - Table 4-128, p 289

- The average annual values are a useful illustration of the impacts, but they hide the considerable inter-annual variability that are contained in the full IMS model runs. (Appendix D contains statistical details and histograms of outcomes over the 10,000 iterations in each model run.)

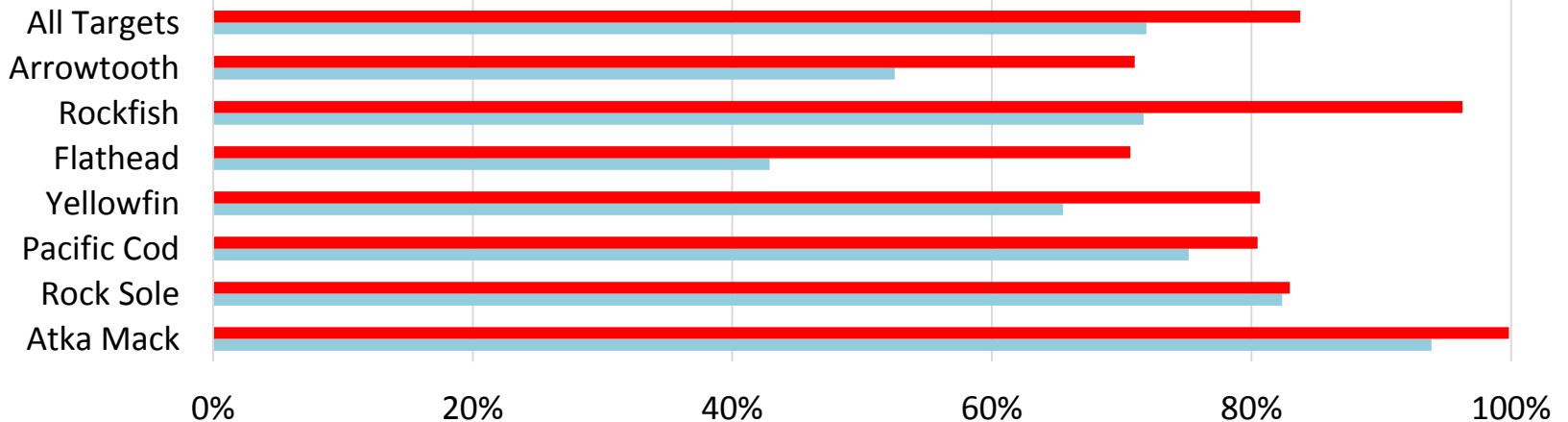
Year	DPV of Wholesale Revenue Under the Status Quo Scen. A - B	1a: -10%	1b: -20%	1c: -30%	1d: -35%	1e: -40%	1f: -45%	1g: -50%
		Forgone Annual Average Discounted Present Value of Wholesale Revenue Under the Alternatives						
		Scen. A - B	Scen. A - B	Scen. A - B	Scen. A - B	Scen. A - B	Scen. A - B	Scen. A - B
2014	\$325.2 - \$325.1	\$0.6 - \$4.0	\$4.5 - \$15.2	\$13.1 - \$32.6	\$20.3 - \$45.4	\$28.4 - \$58.1	\$36.3 - \$71.3	\$46.5 - \$86.8
2015	\$308.9 - \$308.8	\$0.6 - \$3.8	\$4.3 - \$14.5	\$12.4 - \$31.0	\$19.3 - \$43.2	\$27.0 - \$55.2	\$34.5 - \$67.8	\$44.2 - \$82.4
2016	\$293.5 - \$293.4	\$0.5 - \$3.6	\$4.1 - \$13.7	\$11.8 - \$29.4	\$18.3 - \$41.0	\$25.6 - \$52.5	\$32.8 - \$64.4	\$42.0 - \$78.3
2017	\$278.8 - \$278.7	\$0.5 - \$3.4	\$3.9 - \$13.0	\$11.2 - \$28.0	\$17.4 - \$39.0	\$24.3 - \$49.8	\$31.1 - \$61.2	\$39.9 - \$74.4
2018	\$264.9 - \$264.8	\$0.5 - \$3.2	\$3.7 - \$12.4	\$10.6 - \$26.6	\$16.6 - \$37.0	\$23.1 - \$47.3	\$29.6 - \$58.1	\$37.9 - \$70.7
2019	\$251.6 - \$251.5	\$0.5 - \$3.1	\$3.5 - \$11.8	\$10.1 - \$25.2	\$15.7 - \$35.2	\$22.0 - \$45.0	\$28.1 - \$55.2	\$36.0 - \$67.1
2020	\$239.1 - \$239.0	\$0.4 - \$2.9	\$3.3 - \$11.2	\$9.6 - \$24.0	\$14.9 - \$33.4	\$20.9 - \$42.7	\$26.7 - \$52.4	\$34.2 - \$63.8
2021	\$227.1 - \$227.0	\$0.4 - \$2.8	\$3.1 - \$10.6	\$9.1 - \$22.8	\$14.2 - \$31.7	\$19.8 - \$40.6	\$25.4 - \$49.8	\$32.5 - \$60.6
2022	\$215.7 - \$215.7	\$0.4 - \$2.6	\$3.0 - \$10.1	\$8.7 - \$21.6	\$13.5 - \$30.1	\$18.8 - \$38.6	\$24.1 - \$47.3	\$30.9 - \$57.6
2023	\$205.0 - \$204.9	\$0.4 - \$2.5	\$2.8 - \$9.6	\$8.2 - \$20.6	\$12.8 - \$28.6	\$17.9 - \$36.6	\$22.9 - \$45.0	\$29.3 - \$54.7
Average	\$261.0 - \$260.9	\$0.5 - \$3.2	\$3.6 - \$12.2	\$10.5 - \$26.2	\$16.3 - \$36.5	\$22.8 - \$46.7	\$29.2 - \$57.2	\$37.3 - \$69.6

Target Fishery Impacts for A80-CPs under Scenarios A & B with 30% and 50% PSC Limits Reduction Options



Percent of Status Quo Harvest by Target Fishery with a 30% PSC Limit Reduction

■ Scenario A ■ Scenario B



Percent of Status Quo Harvest by Target Fishery with a 50% PSC Limit Reduction

■ Scenario A ■ Scenario B

Adapted from Figure 4-73 on page 293

A80 harvest impacts by target fishery

- **Impacts under a 50% reduction range from 16-28% under Scenarios A-B**
- **Sorted by target fishery volume of harvest:**
 - Yellowfin sole: reductions from 19-35%
 - Atka mackerel: reductions from 0.2-24%
 - Rock sole: reductions from 17-18%
 - Arrowtooth/Kamchatka: reductions from 29-48%
 - Flathead sole: reductions from 29-57%
 - Rockfish: reductions from 4-28%
 - Pacific cod: reductions from 20-25%
 - All other targets: reductions from 21-29%

Estimates of A80 crew member involvement and impacts

- Data on crew members on board are provided in the catch accounting system from 2009 forward from AKFIN for groundfish vessels
- EDR data for A80-CPs provides crew payment and total crew counts for A80-CPs.
- Also describes crew members for two vessel types:
 - Vessels that focus on Atka mackerel
 - Vessels that focus on flatfish
 - (See p. 290)

A80 crew impacts – p. 290, Tables 4-130,131

Vessel Type	50% Cut in PSC Limits		
	Status Quo	Scenario A	Scenario B
	Impacts on Annual Average Payments to Crew		
Atka Mackerel Focus	\$32.17	(\$3.25)	(\$6.45)
Flatfish Focus	\$38.87	(\$6.92)	(\$12.51)
All A80-CPs	\$71.04	(\$10.17)	(\$18.96)

Impacts by Vessel Type on Wholesale Revenues

Vessel Type	50% Cut in PSC Limits		
	Status Quo	Scenario A	Scenario B
	Impacts on Annual Average Wholesale Revenue		
Atka Mackerel Focus	\$118.18	(\$11.94)	(\$23.69)
Flatfish Focus	\$142.77	(\$25.42)	(\$45.96)
All A80-CPs	\$260.95	(\$37.36)	(\$69.65)

Impacts to Amendment 80 Limited Access: Option 1 Suboption 2 (see Section 4.8.2 on p. 299)

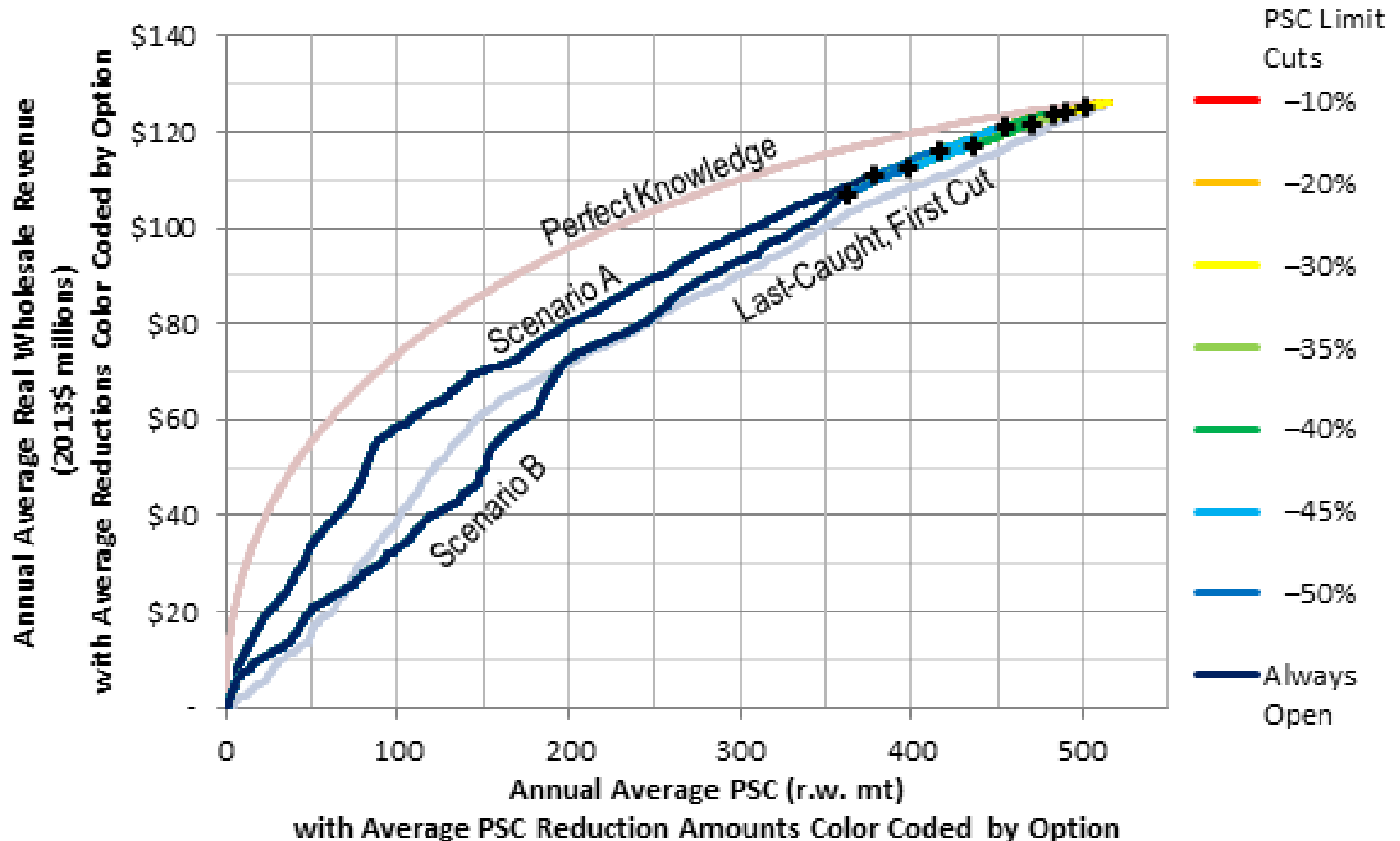
- **No way to know in advance which vessels, if any, will choose to enter the limited access fishery**
- **Adopting a more severe PSC limit reduction for vessels participating in limited access would provide an additional disincentive to leave cooperatives.**
- **Given that the A80 Limited Access fishery could devolve into a race for fish, it is much more likely that halibut encounter rates will be higher than under an A80 cooperative with similar PSC levels.**

LGL-CPs Scenarios

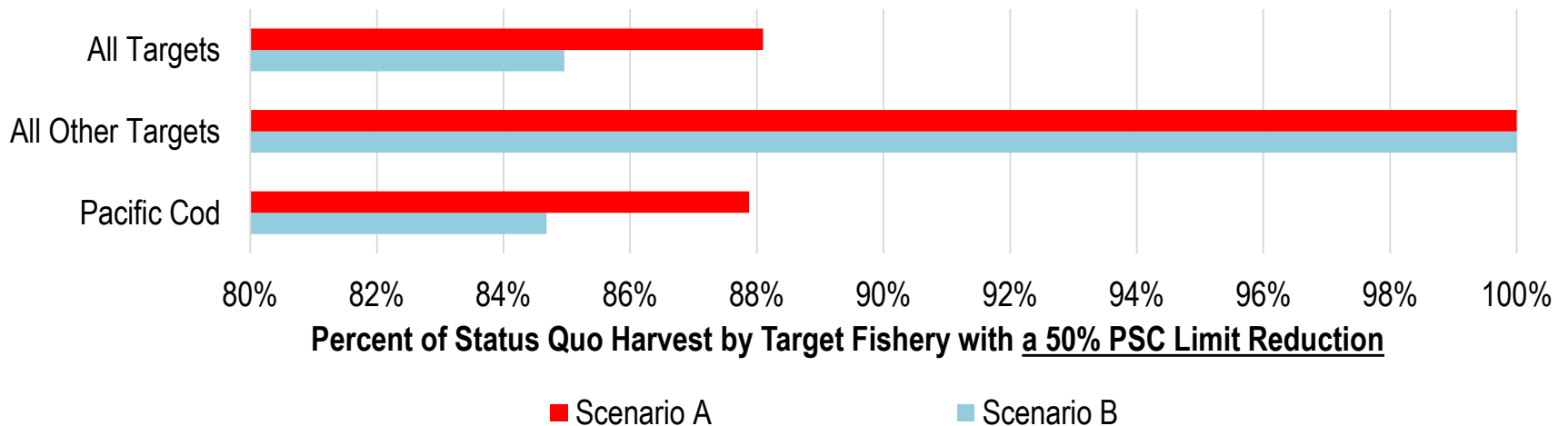
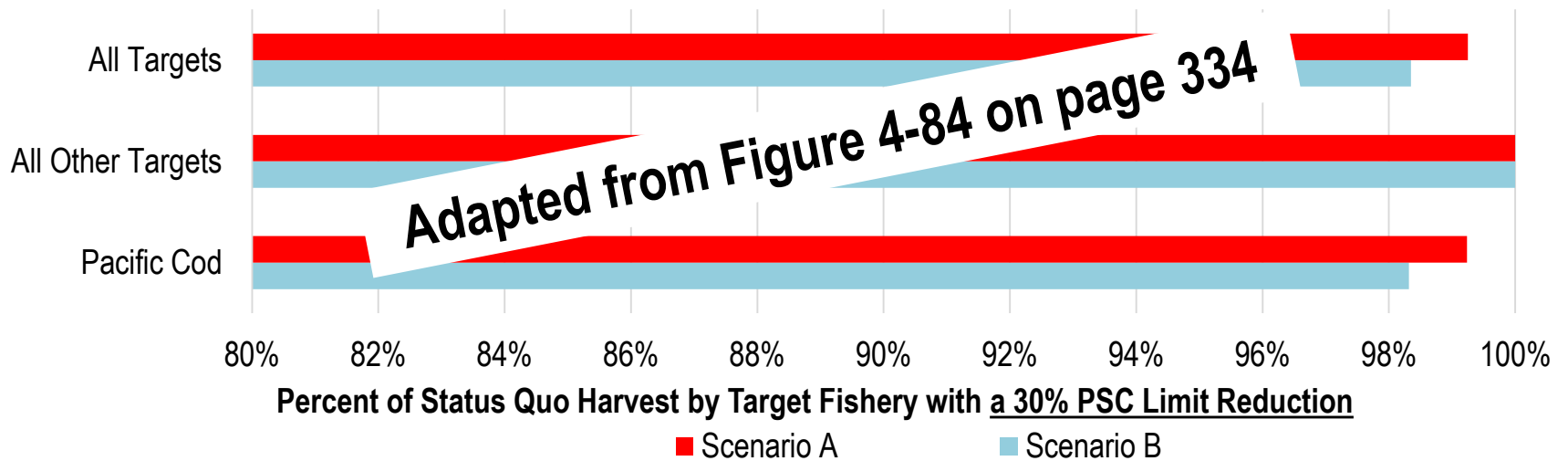
■ Same scenarios as A80: sector operates in a cooperative

- Scenario A assumes they use historic fleet-wide data from the basis years, to determine collectively which fisheries (by target, month and management area) are must be off limits. We assume strict compliance and that there are no barriers that limit transfers of PSC and groundfish among or across cooperatives
- Scenario B assumes there is some friction in PSC transfers—each company retains up to five percent more PSC than they need as a buffer for unexpected bycatch events. Each company has their own limit and each make individual decisions based on company data to determine the months that all of the companies' vessels will operate. No assumptions are made regarding the de-activation of individual vessels

Impacts of on LGL-CPs based on annual average values (p. 330) – numbers in Table 4-161 p 328



Target Fishery Impacts for LGL-CPs under Scenarios A & B with 30% and 50% PSC Limits Reduction Options



Estimates of LLCP crew member involvement and impacts

- No official data on crew shares, or crew member home towns or the total number of crew persons used during the year, except from A80.
- The analysis uses A80-CP data combined with AKFIN crew counts, along with the judgment and experience of the analysts to estimate crew payments and total crew employment counts

LGL-CP crew impacts – p. 332

Status Quo	50% Cut in PSC Limits	
	Scenario A	Scenario B
Impacts on Annual Average Payments to Crew		
\$32.17	(\$3.25)	(\$6.45)
\$38.87	(\$6.92)	(\$12.51)
\$71.04	(\$10.17)	(\$18.96)

Impacts on BSAI TLA Fisheries

- **Target fishery apportionments of the PSC limit for BSAI TLA continue to be used: a) Pacific cod; b) Yellowfin sole; c) Rockfish; and d) Pollock|AtkaM|Other Species**
 - Under both Scenario A and Scenario B, the rockfish apportionment (currently at 5mt) is assumed to be unchanged by the limit reduction
- **The IMS model also assumes that the pollock target fishery remains exempt from the PSC limit**
 - The model incorrectly assumed that the Atka mackerel fishery within the Pollock|AtkaM|Other apportionment is constrained by the PSC Limit.
 - Cuts to the BSAI TLA Atka Mackerel fishery should not have been made.

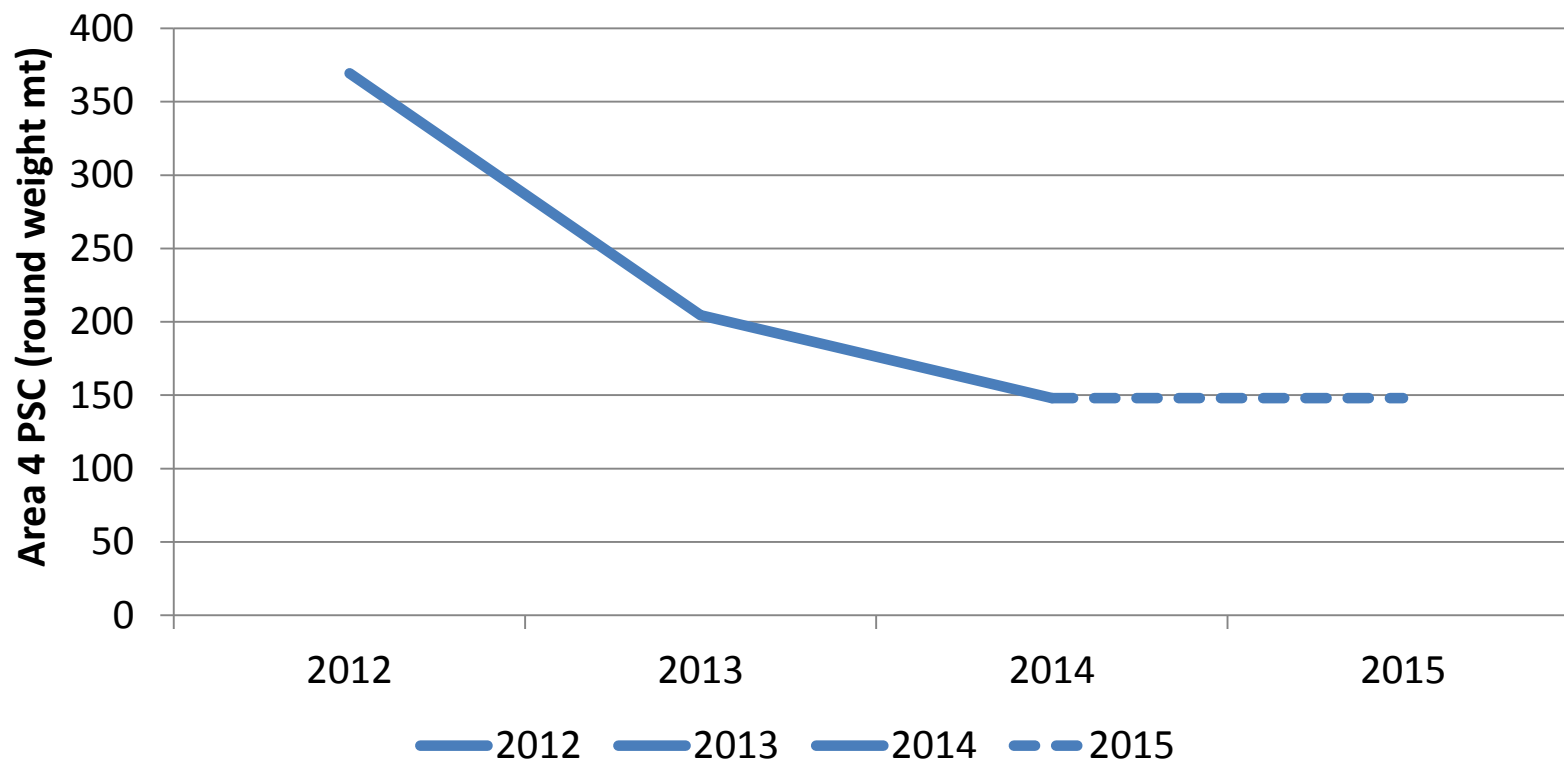
BSAI TLA Fisheries Scenarios

- Under Scenario A (which generates lower impacts overall) the Pollock|Atka Mackerel|Other Species PSC apportionment is reduced along with PSC apportionments for Pacific cod and yellowfin sole
- Under Scenario B (which generates higher impacts overall) the Pollock|Atka Mackerel|Other Species PSC apportionment is held constant (since the pollock fishery is exempt from closures), and PSC apportionments for Pacific cod and yellowfin sole see proportionally greater reductions

Regulations regarding the setting of BSAI TLA apportionments of halibut PSC

- **(B) Fishery categories.** NMFS, after consultation with the Council and after subtraction of PSQ reserves and PSC CQ assigned to Amendment 80 cooperatives, will apportion each PSC limit set forth in paragraphs (e)(1)(i) through (vii) of this section into bycatch allowances for fishery categories defined in paragraph (e)(3)(iv) of this section, based on each category's proportional share of the anticipated incidental catch during a fishing year of prohibited species for which a PSC limit is specified and the need to optimize the amount of total groundfish harvested under established PSC limits.
- **On June 3, 2015, NMFS made a “determination” that Scenario A is unlikely to actually be approved in the annual specification process, unless in fact the halibut PSC in the Pollock|Atka Mackerel|Other Species target fishery had consistently reduced its PSC “voluntarily” to levels that have been assumed for Scenario A.**

Halibut PSC in AFA Pollock Fishery appears to be declining since 2012



- 2015 data are preliminary through May 31, 2015
- The declining trend makes Scenario A somewhat more plausible at least for PSC limit reductions up to 40 percent

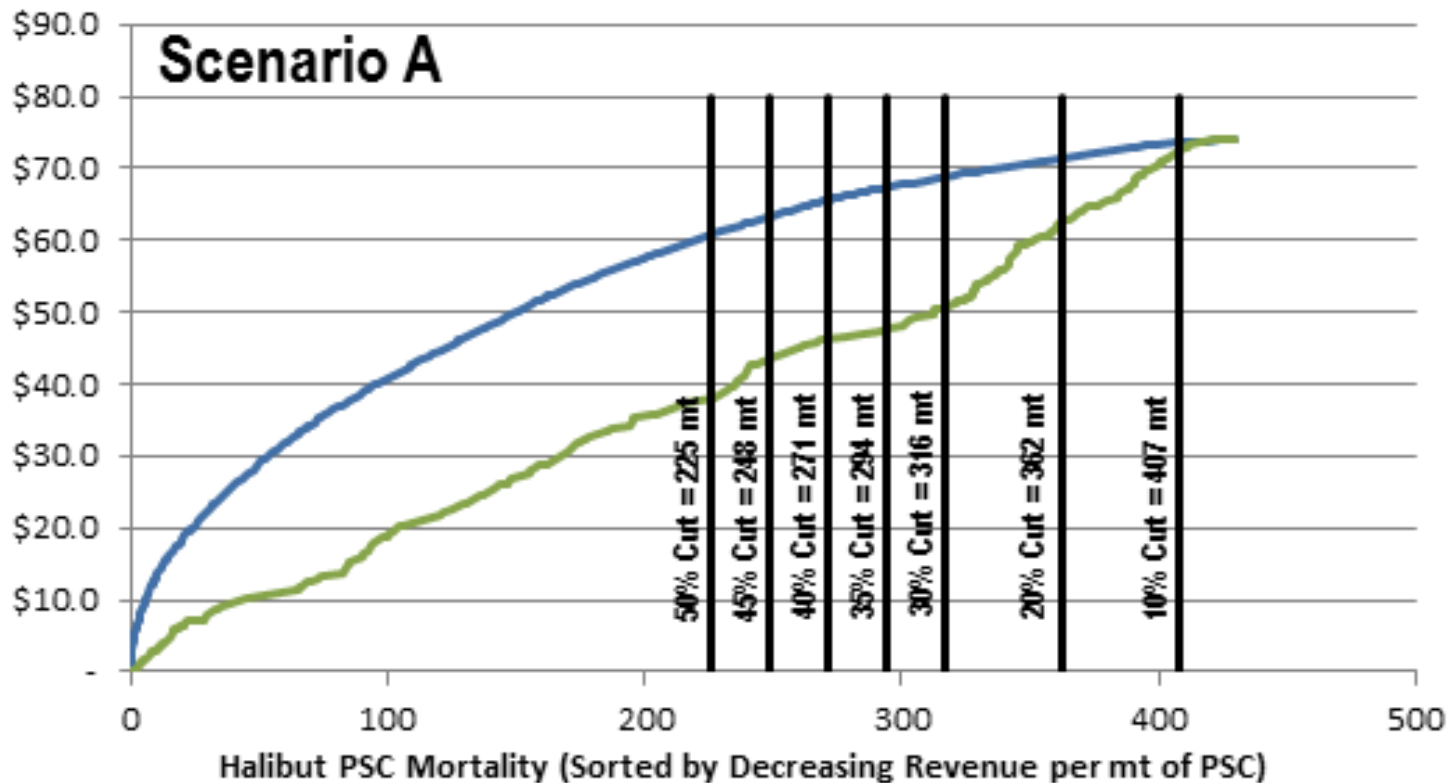
BSAI TLA PSC Apportionments under the sub-Options and Scenarios

	SQ	10%	20%	30%	35%	40%	45%	50%
<u>Scenario A: Assumed BSAI TLA PSC Apportionments</u> when the Base Year is 2013								
Target Fishery								
Pollock Atka M. Other	250.0	224.9	199.7	174.6	162.0	149.4	136.9	124.3
Pacific Cod	453.0	407.4	361.9	316.3	293.5	270.8	248.0	225.2
Yellowfin Sole	227.0	150.2	133.4	116.6	108.2	99.8	91.4	83.0
Rockfish	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
<u>Scenario B: Assumed BSAI TLA PSC Apportionments</u> when the Base Year is 2013								
Pollock Atka M. Other	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0
Pacific Cod	453.0	389.1	325.1	261.2	229.2	197.3	165.3	133.3
Yellowfin Sole	227.0	143.4	119.9	96.3	85.9	74.1	62.3	50.5
Rockfish	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0

BSAI TLA Fisheries Scenarios

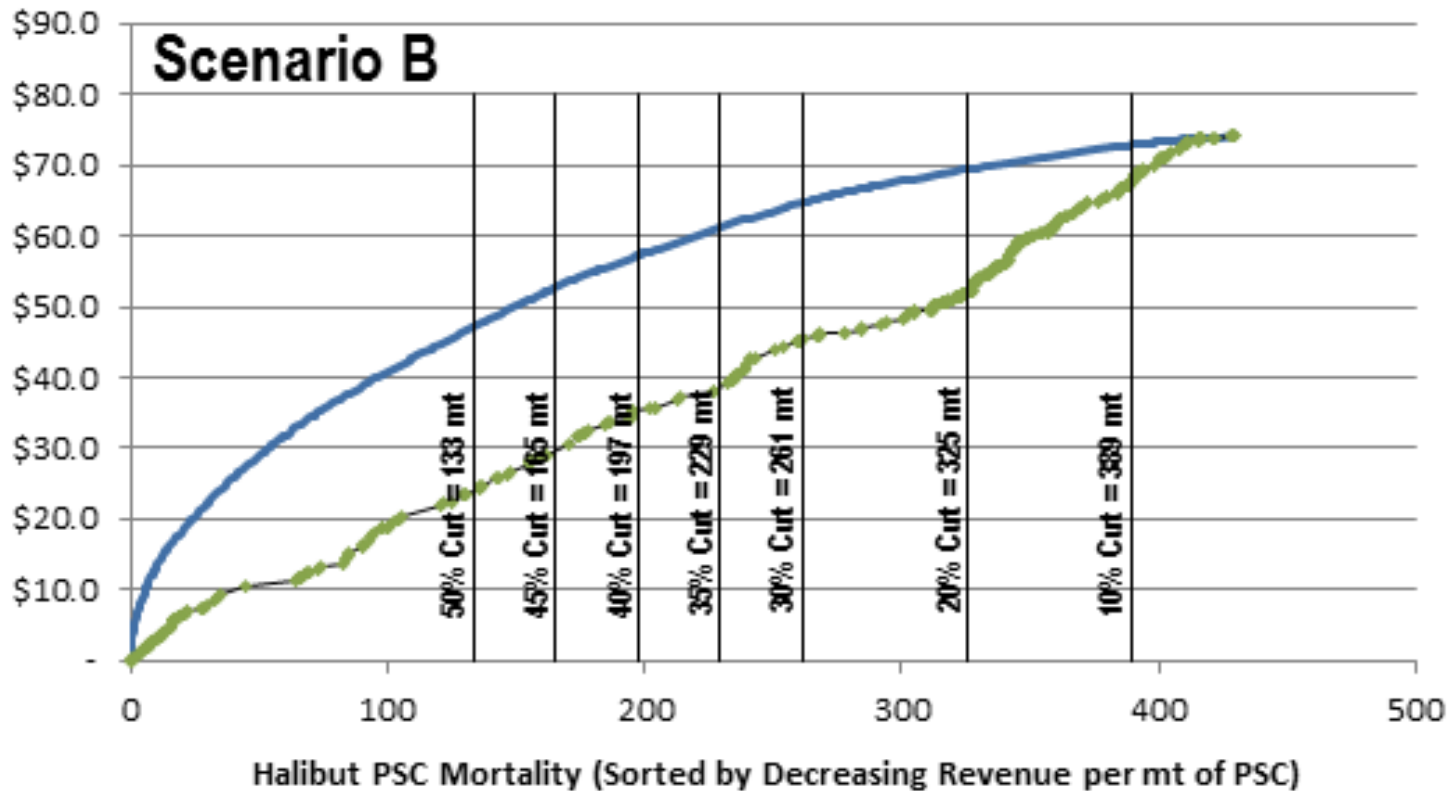
- Under both Scenario A and Scenario B, the Pacific cod fishery is assumed to be a race for fish, and PSC reductions are achieved in a last-caught, first-cut methodology
- Under Scenario A, the yellowfin sole fishery is assumed to be rationalized. Participants determine the order in which months and NMFS areas should be placed off limits in order to reduce their PSC to the new lower limit, while mitigating as much as possible the negative revenue impacts
- Under Scenario B, the yellowfin sole fishery is assumed to be a race for fish, and PSC reductions are achieved in a last-caught, first-cut methodology

Example catch progression lines for BSAI TLA Pacific cod for 2012 (see Fig 4-76 p. 306)



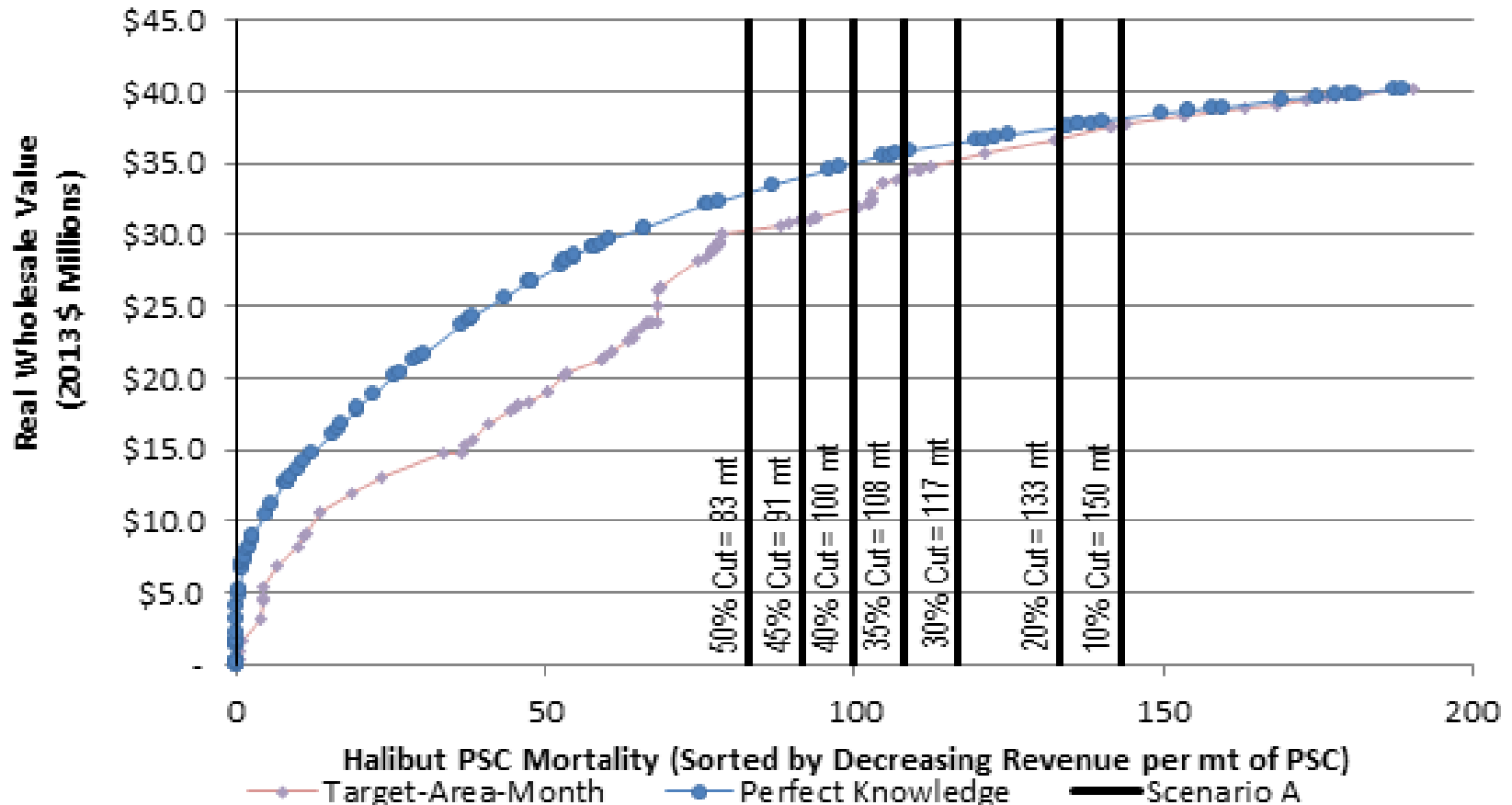
- Because PSC limits change between the two scenarios, a more comprehensive graphic could not be developed

Example catch progression lines for BSAI TLA Pacific cod for 2012 (see p. 306)



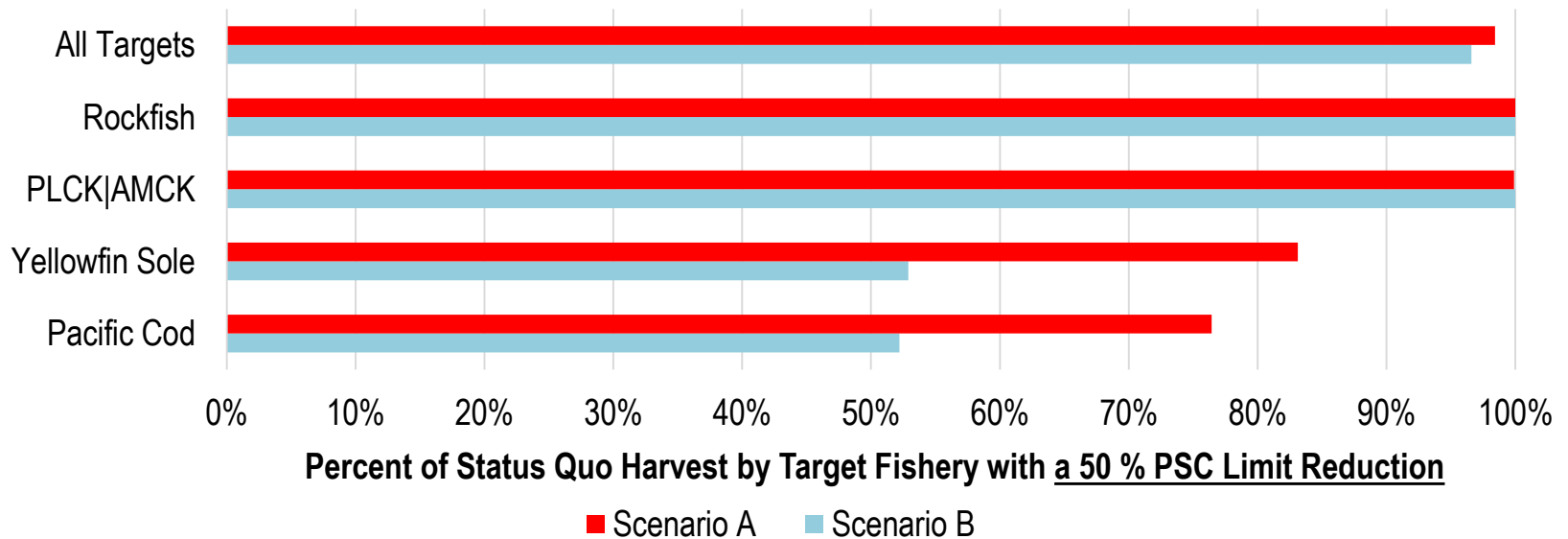
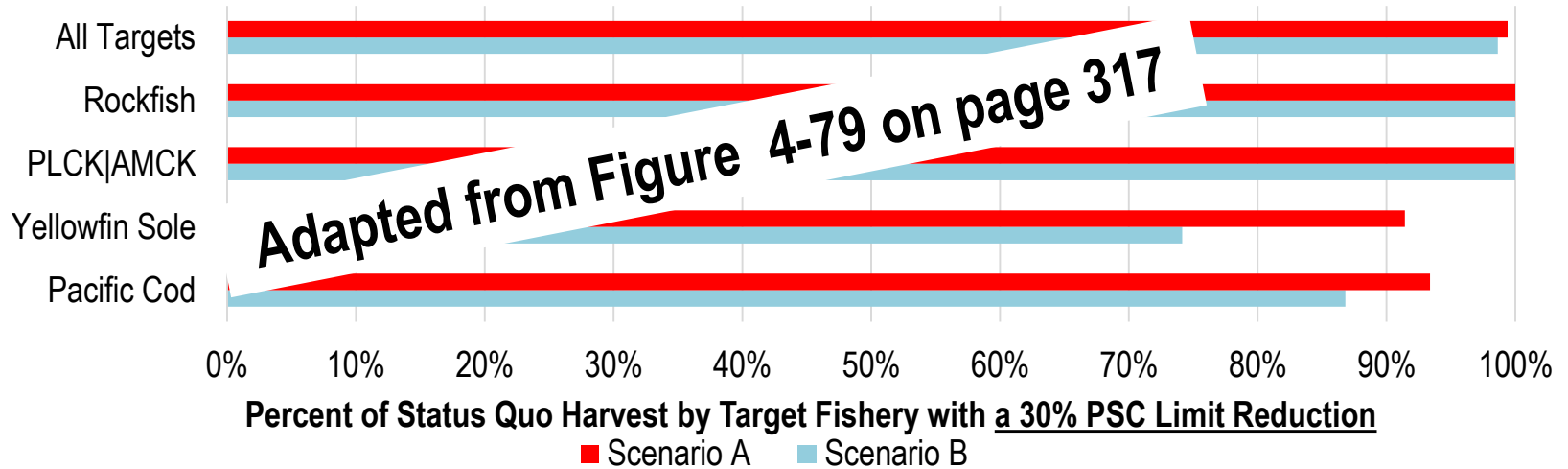
- Because PSC limits change between the two scenarios, a more comprehensive graphic could not be developed

Example catch progression line for BSAI TLA Yellowfin Sole under Scenario A for 2012



- Because PSC limits change between the two scenarios, a more comprehensive graphic could not be developed
- Figure 4-75 on p. 306

Target Fishery Impacts for the BSAI TLA under Scenarios A & B with 30% and 50% PSC Limits Reduction Options



BSAI TLA harvest impacts by target fishery

- Impacts under a 50% reduction range from 1.6-3.4% under Scen. A-B; excluding pollock, range is 21-46%
- Sorted by target fishery volume of harvest:
 - Pacific cod: reductions from 24-48%
 - Yellowfin sole: reductions from 17-47%
 - Atka mackerel: Modelled reduction of 49% under Scenario A, no impact under Scenario B. These reductions are in error.
 - Pollock: no direct impacts
 - Rockfish: no impacts

Estimates of BSAI TLA crew member involvement and impacts

- The analysis uses A80-CP data combined with AKFIN crew counts, along with the judgment and experience of the analysts to estimate crew payments and total crew employment counts
- Estimates for BSAI TLA crew member subgroups: (p 313-4)
 - Diversified AFA-CPs
 - Non-Diversified AFA-CPs
 - Diversified AFA-CVs
 - Non-Diversified AFA-CVs
 - Non-AFA Trawl CVs

Crew Impacts by BSAI TLA Vessel Type

See Table 4-146 to 4-151 on pp. 312–314

Vessel Group	Target Fisheries	Status Quo	50% Cut in PSC Limits	
			Scenario A	Scenario B
Non-Diversified CPs	Pollock Only	\$37.98	(\$0.03)	(\$0.01)
Diversified CPs	Pollock & Yellowfin Sole +	\$77.40	(\$0.67)	(\$2.07)
Non-Diversified CVs	Pollock Only	\$44.99	(\$0.01)	(\$0.01)
Diversified CVs	Pacific cod and Pollock (usually)	\$28.64	(\$1.11)	(\$2.50)
Non-AFA Trawl CVs	Pacific cod and/or Yellowfin Sole	\$2.93	(\$0.92)	(\$1.42)
All BSAI TLA Vessels	All BSAI TLA Targets	\$191.94	(\$2.74)	(\$6.01)

Revenue Impacts by BSAI TLA Vessel Type

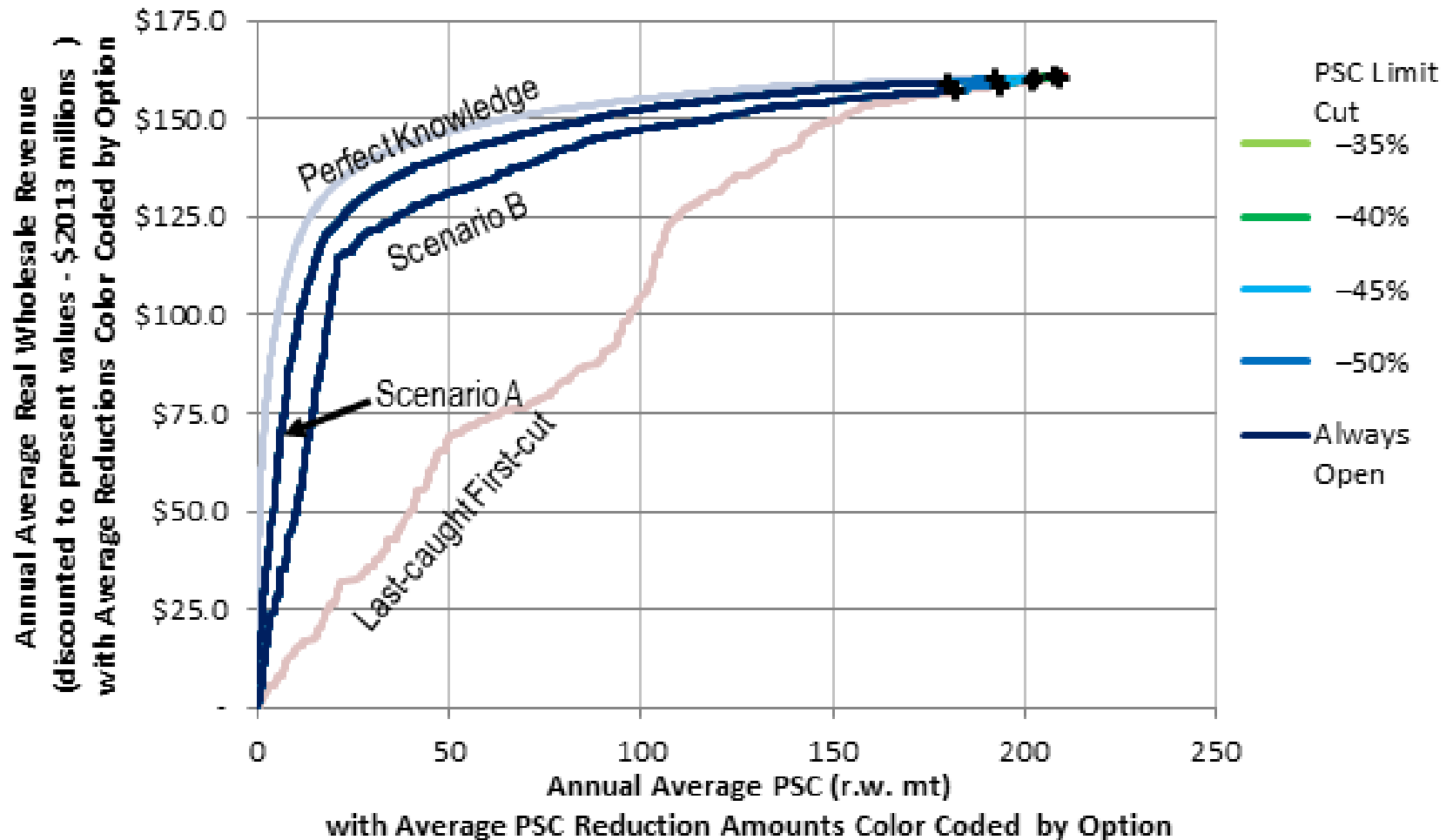
- This table was developed in response to discussions in the AP and does not appear in the document.
- Wholesale revenues are provided for CPs, and Ex-vessel Revenues for CVs

Vessel Group	Target Fisheries	Status Quo	50% Cut in PSC Limits	
			Scenario A	Scenario B
Non-Diversified CPs	Pollock Only	\$37.98	(\$0.03)	(\$0.01)
Diversified CPs	Pollock & Yellowfin Sole +	\$77.40	(\$0.67)	(\$2.07)
Non-Diversified CVs	Pollock Only	\$44.99	(\$0.01)	(\$0.01)
Diversified CVs	Pacific cod and Pollock (usually)	\$28.64	(\$1.11)	(\$2.50)
Non-AFA Trawl CVs	Pacific cod and/or Yellowfin Sole	\$2.93	(\$0.92)	(\$1.42)
All BSAI TLA Vessels	All BSAI TLA Targets	\$191.94	(\$2.74)	(\$6.01)

Impacts on CDQ fisheries - Scenarios

- **Under Scenario A, it is assumed that the organizations make a joint decision to rank target fisheries to determine the fisheries in which all CDQs will participate, and those that will be avoided in order for all CDQ groups to stay under the limit. The ranking is done in terms of the overall wholesale revenue per PSC for each fishery.**
- **Under Scenario B, it is assumed that CDQ organizations make a joint decision to determine which fisheries must be off limits in order for CDQs as a whole to remain below the PSC limit, while cutting the groundfish harvests with high levels of halibut encounters and relatively low amounts of wholesale revenue generated.**

Impacts on CDQ Fisheries based on annual average values (p. 348) – numbers in Table 4-176 p 347



Crew & Revenue Impacts on Vessels in CDQ Fisheries

See Table 4-178 to on p. 349, noting that wholesale revenue portions were included as a result of discussion in the AP.

Vessel Type	Status Quo	50% Cut in PSC Limits	
		Scenario A	Scenario B
Impacts on Payments to Crew			
All AFA-CPs	\$31.91	(\$0.24)	(\$1.16)
All A80-CPs	\$4.47	(\$0.16)	(\$0.20)
LGL-CPs	\$8.30	(\$0.01)	(\$0.15)
All Crew in CDQ fisheries	\$44.68	(\$0.41)	(\$1.51)
Impacts on Wholesale Revenues			
All AFA-CPs	\$118.19	(\$0.89)	(\$4.30)
All A80-CPs	\$16.42	(\$0.59)	(\$0.73)
LGL-CPs	\$23.71	(\$0.03)	(\$0.43)
All Vessels in CDQ fisheries	\$158.32	(\$1.51)	(\$5.46)

CDQ Investments in non-CDQ Groundfish

- **Table 4-73 on p. 200 summarizes CDQ ownership investments in groundfish and crab vessels operating in the BSAI**
- **These investments mean that CDQ groups are affected from three different perspectives:**
 - **Negatively by PSC limit reduction options for the CDQ fishery,**
 - **Positively by increases in commercial halibut fishery harvests**
 - **Negatively by PSC limit reduction options in non-CDQ groundfish fisheries**
- **Table 4-179 on p. 349 summarize the impacts to CDQ groups from PSC reductions in non-CDQ groundfish fisheries**

Foregone Revenue Impacts on CDQ Organizations in Options Affecting other Sectors

Sector	10-year DPV of Wholesale Revenue of CDQ Vessel Assets Under Status Quo	35% Limit Reductions	40% Limit Reductions	45% Limit Reductions	50% Limit Reductions
		10-Year Foregone Discounted Present Value of Revenue Under the Alternatives Incurred by Vessel Assets Owned by CDQ Organizations			
	Scen. A - B	Scen. A - B	Scen. A - B	Scen. A - B	Scen. A - B
A80-CPs	\$37.6	\$2.6 - \$6.6	\$3.7 - \$8.5	\$4.8 - \$10.7	\$6.6 - \$12.5
BSAI TLA	\$853.3	\$2.9 - \$8.4	\$3.8 - \$9.6	\$4.5 - \$11.9	\$5.4 - \$16.1
LGL-CPs	\$246.5	\$5.4 - \$6.8	\$8.9 - \$12.7	\$16.2 - \$18.6	\$27.0 - \$28.9
CDQs	\$392.6	\$0.0 - \$1.2	\$0.2 - \$3.0	\$0.9 - \$7.8	\$2.6 - \$12.4
All	\$1,529.9	\$10.9 - \$22.9	\$16.7 - \$33.8	\$26.3 - \$48.9	\$41.6 - \$69.9
Percentage of each Sector's Foregone Revenues Incurred by Vessel Assets Owned by CDQ Organizations					
A80-CPs	1.93%	1.91 - 1.85%	1.90 - 1.82%	1.90 - 1.77%	1.85 - 1.75%
BSAI TLA	11.17%	11.21 - 11.24%	11.22 - 11.28%	11.23 - 11.31%	11.27 - 11.32%
LGL-CPs	25.83%	25.76 - 26.02%	25.91 - 26.34%	26.18 - 26.75%	26.09 - 26.80%
CDQs	32.69%	32.70 - 32.64%	32.70 - 32.64%	32.73 - 32.63%	32.75 - 32.47%
All	13.03%	13.15 - 13.32%	13.20 - 13.40%	13.23 - 13.46%	13.26 - 13.50%

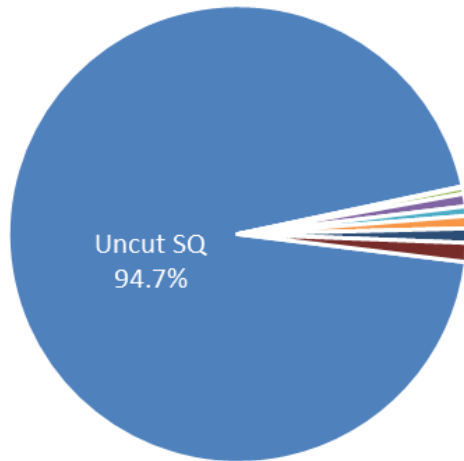
■ See Table 179 on Page 349

Impacts on Groundfish Harvests Combined Across Options (Includes Pollock)

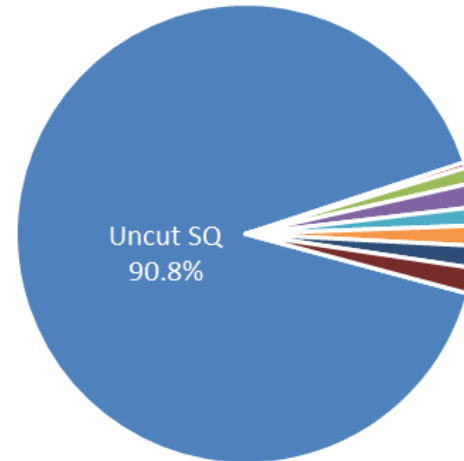
Reductions from status quo groundfish harvest (including pollock) in all affected fisheries

Each colored wedge represents the percent of groundfish harvest reduction from a PSC reduction percentage (suboptions (a) to (g), 10 to 50%) applied equally across all sectors

Scenario A



Scenario B



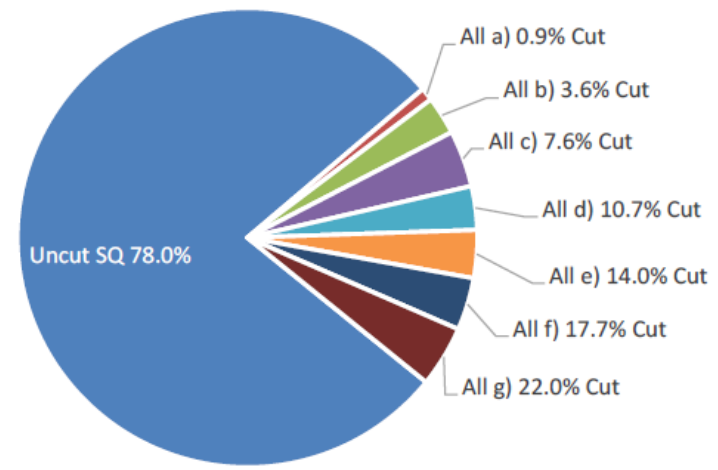
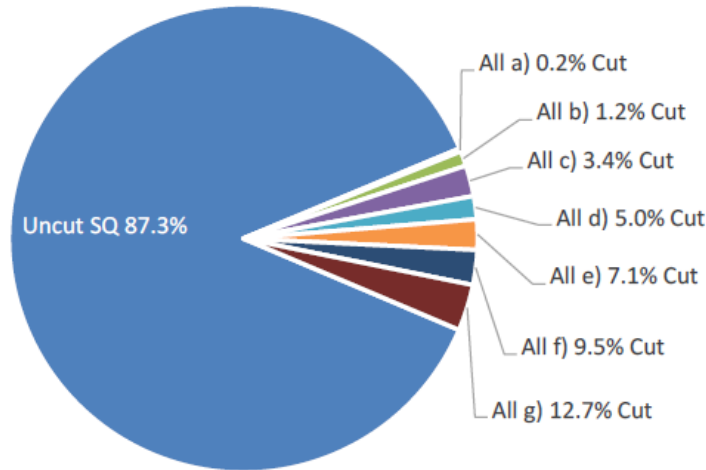
Impacts on Groundfish Harvests Combined Across Options (Excludes Pollock)

Reductions from status quo groundfish harvest (excluding pollock) in all affected fisheries

Each colored wedge represents the percent of groundfish harvest reduction of a PSC reduction percentage (suboptions (a) to (g), 10 to 50%) applied equally across all sectors

Scenario A

Scenario B



Responses to PSC limit reductions

(See Section 4.13.2.2 p 381)

- Behavior change can be measured in terms of groundfish harvest, halibut encounters, halibut encounter rates, and discard mortality rates
- Mathematically, this can be described as:
$$\text{Halibut PSC (kg)} = \text{groundfish (mt)} \times \text{halibut encounter rate (kg/mt)} \times \text{DMR.}$$

Groundfish Behavioral Changes in the IMS Model

- **Modelled behavioral changes are captured in the Scenario A and in Scenario B for rationalized fisheries.**
 - A80 CPs when operating in cooperatives
 - LGL CPs
 - All groundfish CDQ fisheries
 - AFA pollock fisheries in the BSAI TLA
 - BSAI TLA Yellowfin sole fishery under Scenario A
- **Rationalized fisheries can exert some control over which target fisheries (records) are included or are cut—these behavior changes are a key feature of the IMS Model**
- **Race-for-fish fisheries cannot control which records are kept or cut—PSC reductions use a last-caught first-cut process**

Groundfish Behavioral Changes in the IMS Model

- **A PSC cut with no behavior change would equate to a change in groundfish harvested, but no change in the halibut encounter rate or in the DMR.**
 - For example a 10% reduction in groundfish with no changes in halibut encounter rates or in the DMR would result in a 10% reduction in PSC
 - If there are behavioral changes, then we would see changes in the halibut encounter rate, or in the DMR as well as changes in groundfish
- **Behavioral changes that reduce halibut encounter rates or DMRs within a given harvest record are certainly possible, but are not included in the IMS Model**

Groundfish harvest, halibut encounters, halibut encounter rates (HER), & PSC in the BSAI TLA under limit reduction options

Variable	Percentage Change from Status Quo Under the Suboptions						
	1a: -10%	1b: -20%	1c: -30%	1d: -35%	1e: -40%	1f: -45%	1g: -50%
	Scenario A						
Groundfish Harvest (Δ %)	-0.9%	-3.4%	-8.2%	-10.2%	-13.4%	-15.8%	-21.0%
Halibut Encounters (Δ %)	-2.8%	-6.4%	-11.6%	-13.8%	-17.7%	-21.8%	-26.8%
Halibut Encounter Rate (Δ %)	-2.0%	-3.1%	-3.7%	-4.0%	-5.0%	-7.1%	-7.4%
Halibut PSC mortality (Δ %)	-3.0%	-6.6%	-12.1%	-14.3%	-18.2%	-22.4%	-27.4%
	Scenario B						
Groundfish Harvest (Δ %)	-2.3%	-10.0%	-18.4%	-24.9%	-31.0%	-38.1%	-45.9%
Halibut Encounters (Δ %)	-3.9%	-9.6%	-17.8%	-24.1%	-30.8%	-39.4%	-48.3%
Halibut Encounter Rate (Δ %)	-1.6%	+0.4%	+0.6%	+1.1%	+0.3%	-2.1%	-4.5%
Halibut PSC mortality (Δ %)	-4.1%	-10.0%	-18.3%	-24.6%	-31.2%	-39.8%	-48.7%

Table 4-205, p 382

Groundfish harvest, halibut encounters, halibut encounter rates (HER), & PSC for A80-CPs under limit reduction options

Variable	Percentage Change from Status Quo Under the Suboptions						
	1a: -10%	1b: -20%	1c: -30%	1d: -35%	1e: -40%	1f: -45%	1g: -50%
	Scenario A						
Groundfish Harvest (Δ %)	-0.2%	-1.7%	-4.7%	-7.1%	-9.9%	-12.7%	-16.2%
Halibut Encounters (Δ %)	-1.9%	-9.4%	-20.4%	-26.2%	-31.9%	-37.6%	-43.2%
Halibut Encounter Rate (Δ %)	-1.7%	-7.8%	-16.4%	-20.6%	-24.4%	-28.5%	-32.2%
Halibut PSC mortality (Δ %)	-2.0%	-9.4%	-20.3%	-26.2%	-31.8%	-37.5%	-43.1%
	Scenario B						
Groundfish Harvest (Δ %)	-1.3%	-5.1%	-10.7%	-14.8%	-18.8%	-23.0%	-28.1%
Halibut Encounters (Δ %)	-2.9%	-10.6%	-21.4%	-27.7%	-32.7%	-38.2%	-44.0%
Halibut Encounter Rate (Δ %)	-1.6%	-5.8%	-11.9%	-15.1%	-17.1%	-19.8%	-22.2%
Halibut PSC mortality (Δ %)	-2.9%	-10.7%	-21.4%	-27.7%	-32.7%	-38.2%	-44.0%

Table 4-205, p 382

Appendix B evaluates other opportunities to mitigate PSC reductions

- Josh Keaton of NMFS-AKR will summarize



NOAA
FISHERIES

Alaska Region

C-2 Halibut PSC Appendix B

Josh Keaton
Inseason Management

June 2015

Need for Appendix B

- Vessel operators typically change how they operate as they seek to maximize profits under new constraints.

- Assumption #34 (pg 268)

The assumption that all individual vessel records are either used in their entirety or cut from the fishery to reduce PSC limits, precludes any behavioral changes that alter the halibut encounters within a given record or that increase the amount of groundfish harvested with the same amount of PSC. These types of cost-free behavioral changes are not part of the IMS Model.

Differences in scale of record

Appendix B Analysis – Vessel Haul / Daily Scale

Economic Analysis – Vessel/Month/Target/Area

Key points

- Qualitative analysis of potential responses that could be practically implemented and may result in less impacts
 - Qualitative due to lack of certainty in predicting response and success of response
- Bering Sea Only
 - Some vessels have more opportunity elsewhere
- Total Halibut use; not mortality

These are complex fisheries with lots of factors that influence them. Responses to high halibut may not always result in lower halibut PSC and may result in higher incidental catches of other species.

Amendment 80 Rates

Table 1; Page 424

	2008	2009	2010	2011	2012	2013	2014	2011-2014
75th	14.61	17.20	17.01	9.88	11.75	12.87	12.83	12.04
76th	15.69	18.41	17.91	10.80	12.71	13.74	13.55	12.79
77th	16.82	19.37	18.82	11.56	13.71	14.57	14.20	13.67
78th	18.09	20.48	19.96	12.55	14.55	15.50	14.90	14.48
79th	19.32	21.72	21.19	13.45	15.74	16.60	15.59	15.40
80th	20.54	23.08	22.49	14.56	16.84	17.69	16.48	16.44
81st	21.85	24.35	23.83	15.59	17.99	18.72	17.52	17.57
82nd	23.56	25.89	25.23	16.90	19.12	19.86	18.52	18.68
83rd	25.28	27.45	27.04	18.17	20.37	21.21	19.71	19.89
84th	27.10	29.12	28.42	19.53	22.04	22.68	20.75	21.18
85th	29.10	30.77	30.20	20.93	23.90	24.14	21.96	22.65
86th	31.03	32.70	32.02	22.55	25.59	25.74	23.10	24.34
87th	33.52	34.84	34.54	24.73	27.44	27.43	24.67	25.97
88th	36.09	37.39	37.02	26.67	29.58	29.49	25.99	27.78
89th	39.02	40.25	39.36	28.89	32.27	31.80	27.77	29.93
90th	41.91	43.82	42.26	31.45	35.02	34.08	29.50	32.41
91st	46.25	47.95	45.97	34.48	38.27	36.47	31.80	34.99
92nd	50.90	51.52	50.74	38.29	42.19	39.79	34.19	38.33
93rd	55.70	55.72	55.82	43.08	46.88	43.63	37.41	42.21
94th	62.91	61.47	61.45	48.59	52.46	48.97	40.71	47.21
95th	71.68	69.24	70.45	54.55	59.50	55.19	45.13	53.02
96th	82.39	81.59	80.08	63.38	67.39	62.33	50.60	60.76
97th	96.30	96.80	96.64	74.43	80.32	72.01	59.54	70.84
98th	117.19	122.80	118.75	95.05	99.90	87.03	73.21	87.69
99th	160.84	174.09	175.48	134.26	137.79	125.74	100.73	125.66

Rate kg/mt
32.41 used in analysis

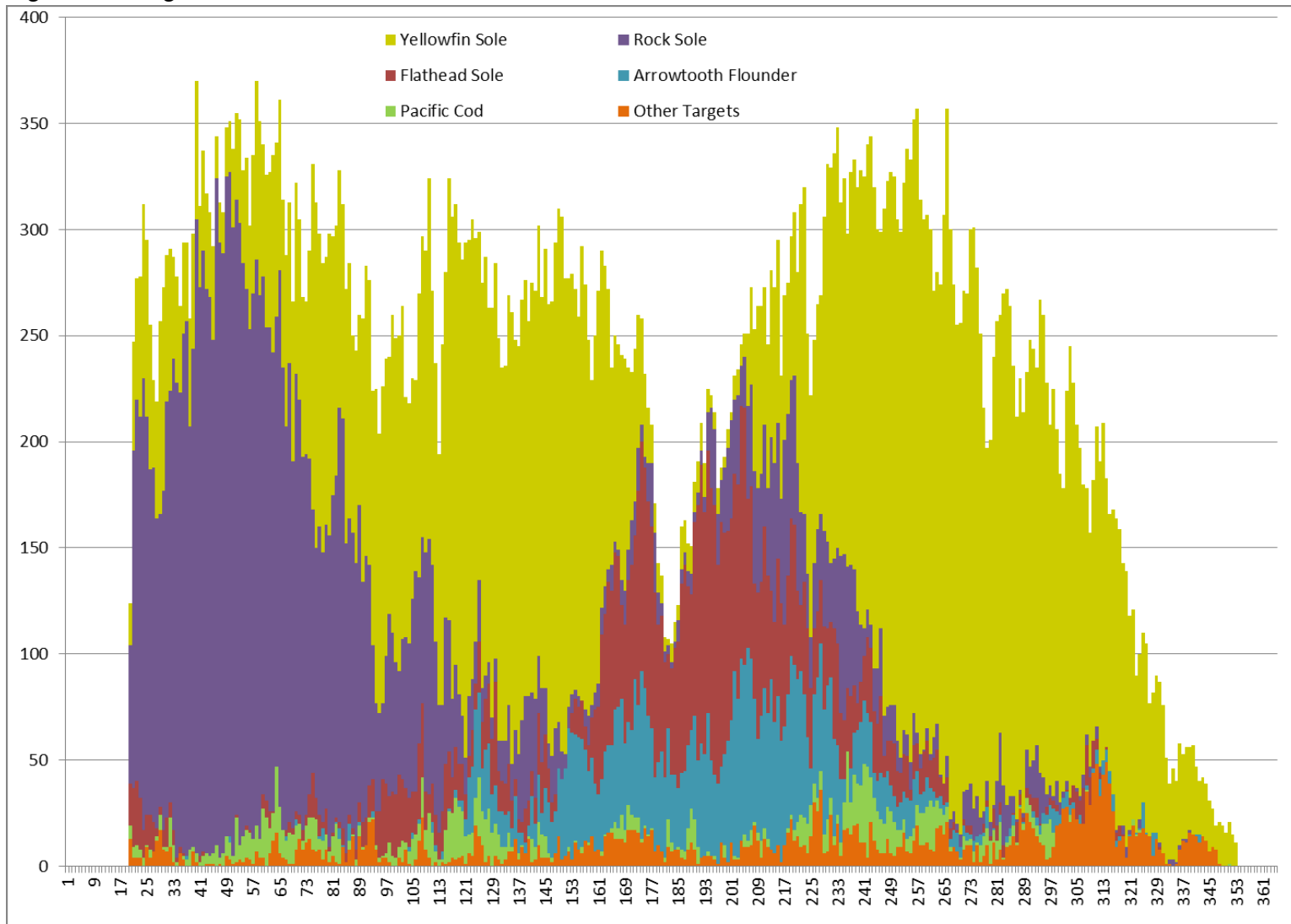
Halibut catch rate 3.24%
of total catch

Total Halibut not mortality.
Various DMRs 73% -88%

*90th percentile mortality
~2.4% to ~2.9%*

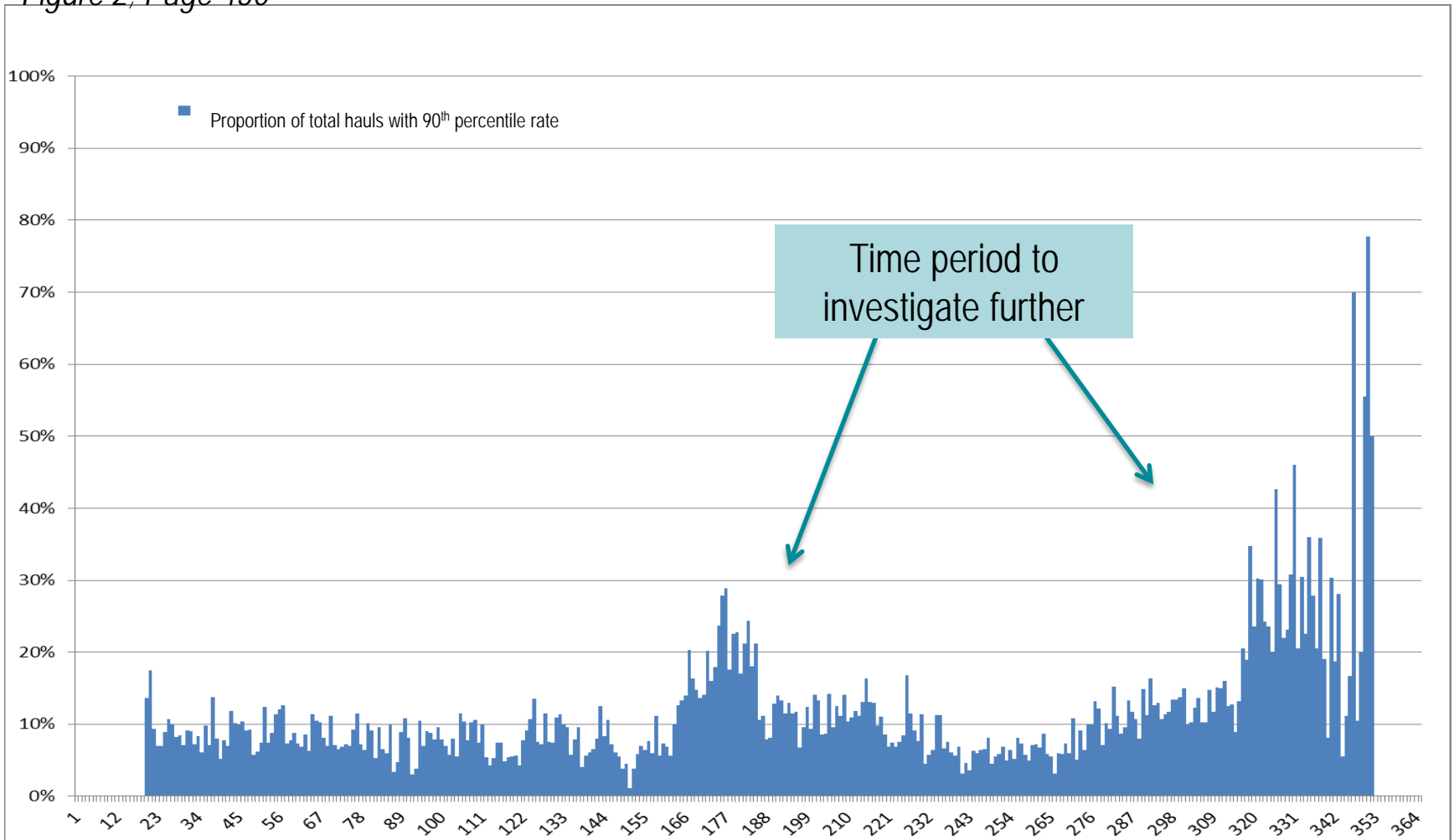
2011-2014 Amendment 80 hauls per day / target

Figure 1; Page 429



2011-2014 Amendment 80 proportion of 90th percentile hauls relative to total hauls

Figure 2; Page 430



Reaction Analysis

An attempt was made to analyze how the fleet is currently reacting to high rate hauls and how the fleet might improve reaction.

Method: After a haul with 90th percentile rate, subsequent two hauls checked

- If rate is higher than 90th percentile on third haul; identified as “no reaction”, else identified as “reaction”
- Third haul needs to be from same vessel, same time period, and same general area
- Why would a vessel operator not react?
 - End of trip/season
 - High rates on your vessel; even higher on other vessels
 - A more limiting species such as Pacific cod

Amendment 80 Vessel Specific Effects

Table 4 Proportion of A80 hauls greater than 90th Percentile; Page 433

Vessel	2008	2009	2010	2011	2012	2013	2014
A	4%	10%	11%	10%	10%	8%	9%
B	12%	9%	13%	10%	9%	5%	11%
C	8%	12%	9%	8%	18%	9%	7%
D	23%	28%	19%	14%	17%	15%	11%
E	12%	11%	9%	10%	16%	14%	7%
F	18%	19%	24%	20%	10%	17%	13%
G	13%	21%	15%	12%	8%	18%	5%
H	17%	10%	13%	6%	3%	5%	4%
I	10%	12%	12%	11%	10%	13%	11%
J	19%	16%	16%	9%	11%	16%	10%
K	10%	16%	14%	10%	10%	10%	10%
L	16%	27%	30%	13%	19%	17%	15%
M	13%	10%	10%	7%	8%	10%	7%
N	17%	5%	8%	5%	11%	8%	11%
O	11%	16%	8%	10%	12%	10%	9%
P	7%	11%	12%	5%	8%	9%	8%
Q	9%	12%	10%	9%	10%	9%	10%
R	18%	20%	31%	16%	5%	21%	8%

What is vessel H doing that results in low occurrence of high rate hauls and better reaction to high rate hauls?

Table 5 Proportion of A80 hauls greater than 90th Percentile with reaction; Page 434

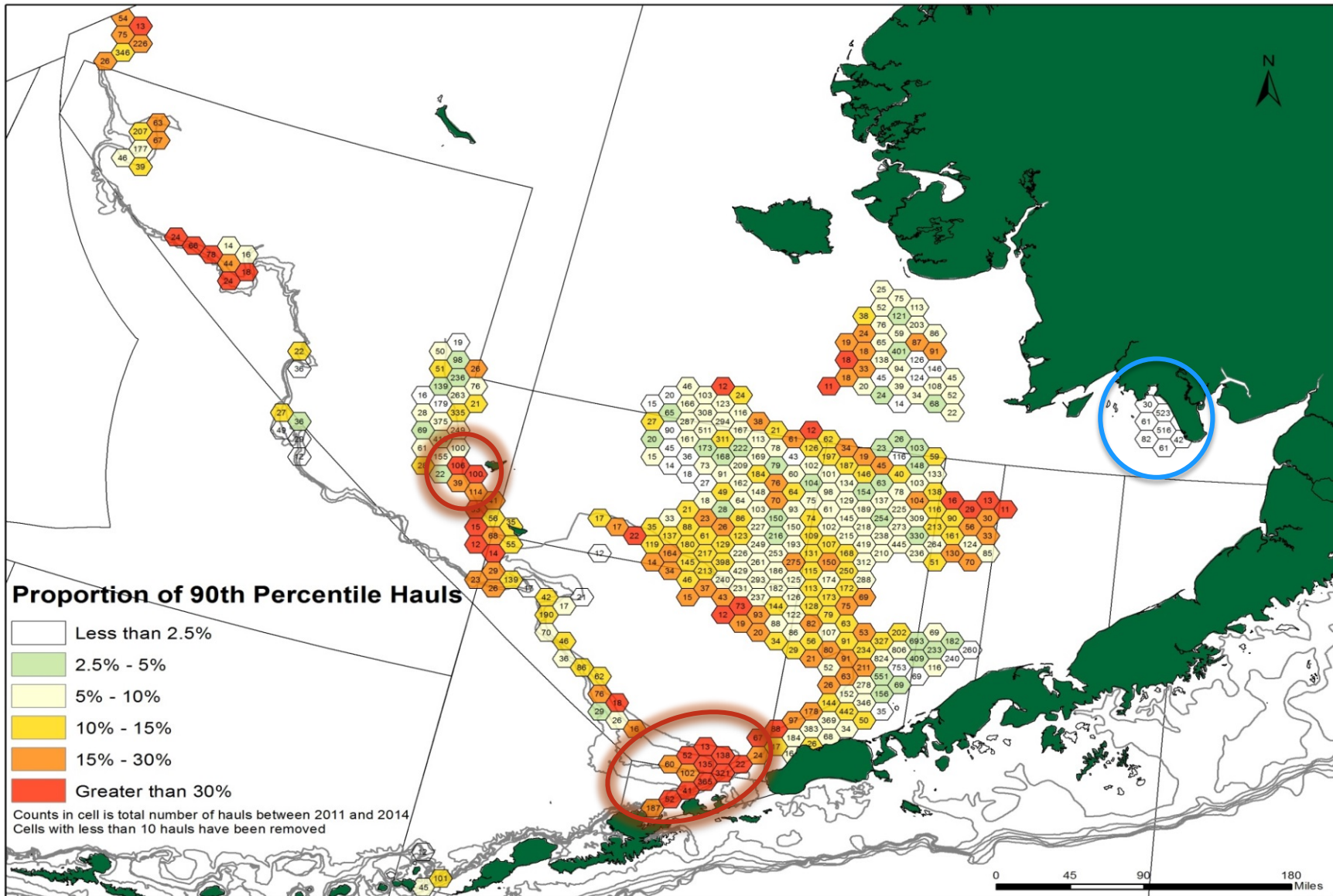
Vessel	2008	2009	2010	2011	2012	2013	2014
A	100%	79%	100%	82%	70%	80%	88%
B	78%	81%	80%	84%	76%	93%	84%
C	73%	75%	81%	71%	63%	86%	87%
D	52%	66%	76%	63%	63%	89%	80%
E	79%	71%	83%	78%	53%	73%	84%
F	60%	64%	54%	55%	72%	67%	50%
G	72%	61%	70%	75%	68%	70%	82%
H	58%	63%	73%	88%	94%	100%	97%
I	74%	82%	78%	73%	61%	82%	82%
J	69%	68%	71%	83%	72%	67%	71%
K	76%	75%	74%	77%	69%	78%	84%
L	48%	66%	44%	71%	71%	48%	69%
M	73%	84%	81%	84%	77%	82%	95%
N	55%	90%	92%	67%	68%	78%	84%
O	74%	78%	81%	72%	70%	80%	94%
P	83%	68%	69%	89%	63%	87%	89%
Q	71%	72%	73%	71%	72%	80%	86%
R	73%	63%	46%	59%	100%	75%	67%

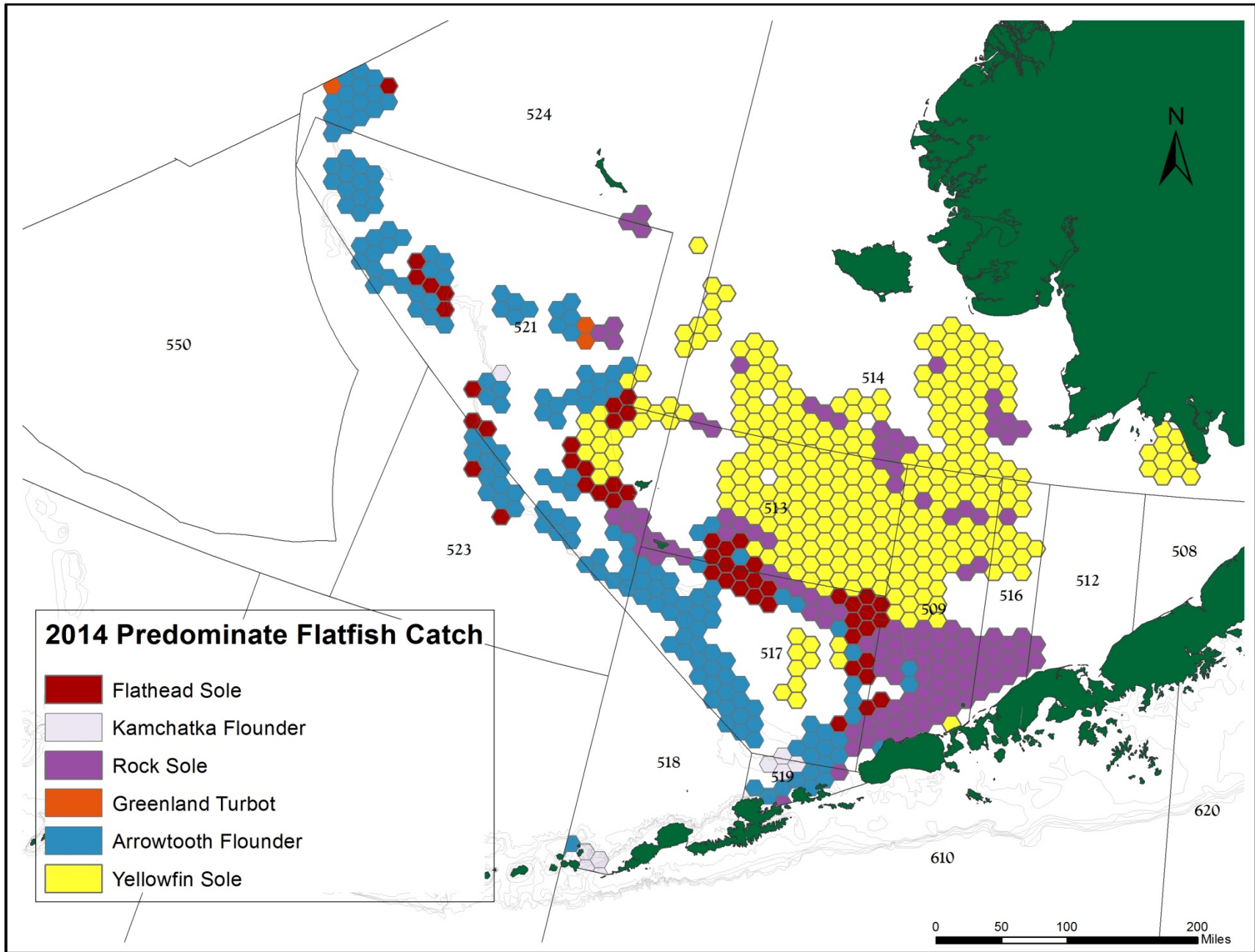
How can vessel L improve performance in avoiding high rates and increase reaction?

Note: Some vessels removed to protect confidentiality

Amendment 80

Figure 4; Page 435





Further review of areas with high rates

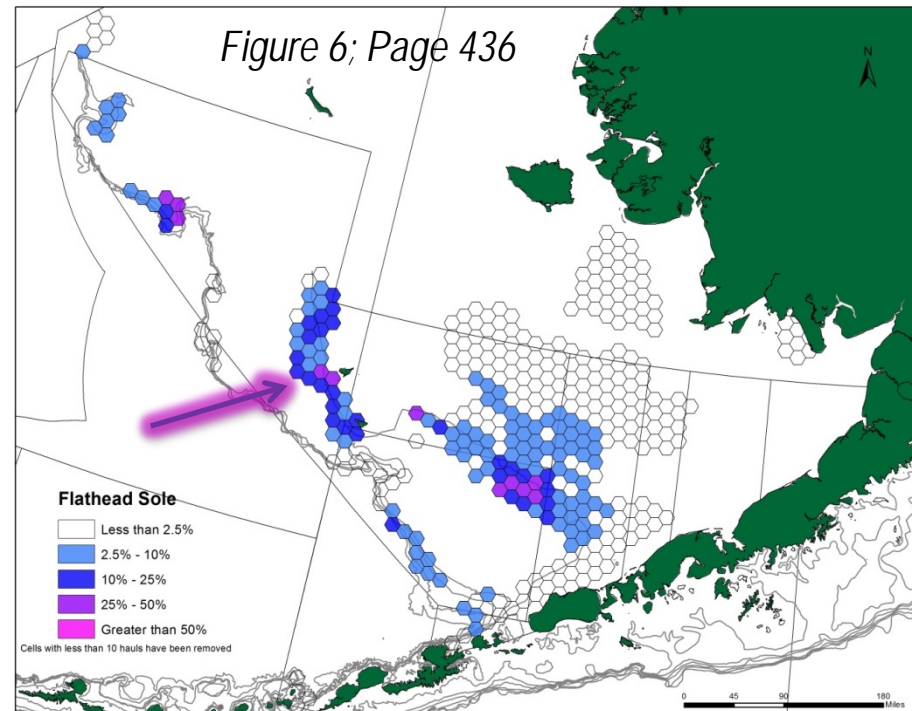
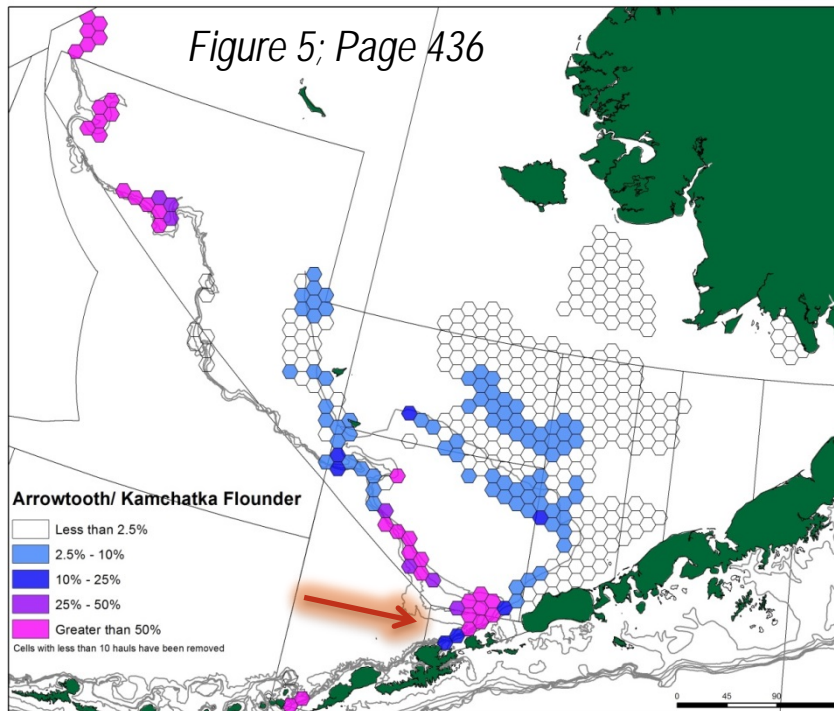


Table 3; Proportion of high rate hauls in the Amendment 80 sector to total hauls by target fishery

	Arrowtooth Flounder	Flathead Sole	Rock Sole	Yellowfin Sole
2008	29%	19%	18%	10%
2009	33%	19%	20%	10%
2010	25%	17%	18%	13%
2011	21%	27%	10%	8%
2012	49%	37%	6%	8%
2013	29%	19%	12%	9%
2014	19%	10%	9%	8%

Page 432

Trawl Limited Access CP Rates

Table 6; Page 438

	2008	2009	2010	2011	2012	2013	2014	2011-2014
75th	8.49	14.45	0.00	3.61	5.64	7.62	9.72	7.12
76th	9.34	15.61	0.00	4.59	6.32	8.43	10.36	7.85
77th	9.98	16.60	0.00	5.34	6.96	8.95	11.13	8.64
78th	10.66	17.45	0.00	5.93	8.00	9.73	11.88	9.32
79th	11.28	18.22	0.00	6.34	9.13	10.60	12.45	10.22
80th	11.70	20.14	0.00	7.49	10.11	11.36	13.28	11.22
81st	12.32	21.43	0.00	8.43	10.76	12.00	14.06	11.96
82nd	13.32	23.92	0.00	9.72	11.98	12.82	14.77	12.89
83rd	14.71	25.16	0.00	11.18	12.78	13.55	15.45	13.95
84th	15.61	26.09	0.00	12.57	14.86	14.30	16.28	14.86
85th	16.36	26.91	0.00	14.02	16.12	15.45	17.09	15.95
86th	17.31	30.35	0.00	15.77	16.95	16.65	18.01	17.01
87th	19.46	31.82	0.74	17.53	18.73	17.61	19.22	18.29
88th	21.18	32.99	1.23	19.58	20.02	18.99	20.37	19.62
89th	23.60	35.62	1.61	21.57	21.38	20.68	21.45	21.15
90th	25.28	38.01	2.58	23.36	23.32	22.08	23.57	22.97
91st	27.50	39.70	4.00	24.95	25.65	24.09	26.53	25.24
92nd	29.77	44.77	6.58	26.86	27.68	25.78	28.81	27.22
93rd	32.74	47.28	9.22	29.41	31.01	28.01	31.13	30.07
94th	36.64	50.18	12.41	34.08	34.04	33.07	34.31	33.89
95th	39.06	52.93	13.58	38.60	41.23	36.71	37.03	37.90
96th	42.09	58.43	19.21	43.37	48.95	43.03	42.05	43.60
97th	48.06	71.28	27.65	58.85	55.49	54.15	47.94	54.52
98th	64.33	81.02	41.60	75.50	69.63	69.25	61.24	68.34
99th	89.72	116.42	55.16	121.69	99.31	101.84	96.82	104.55

Rate kg/mt
22.97 used in analysis

Halibut catch rate 2.29%
of total catch

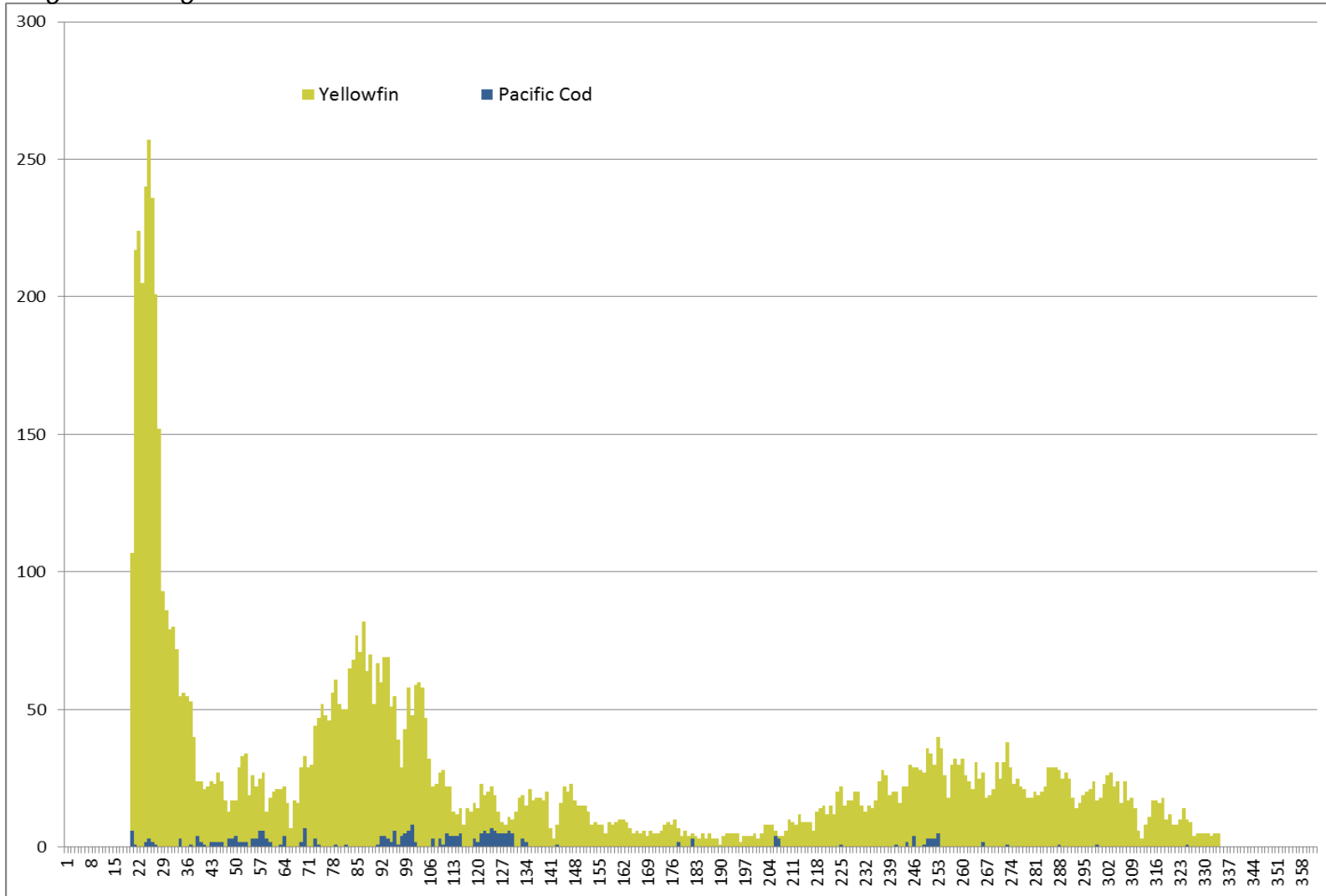
Total Halibut not mortality.

DMR for Yellowfin: 83%

90th percentile mortality
~1.9%

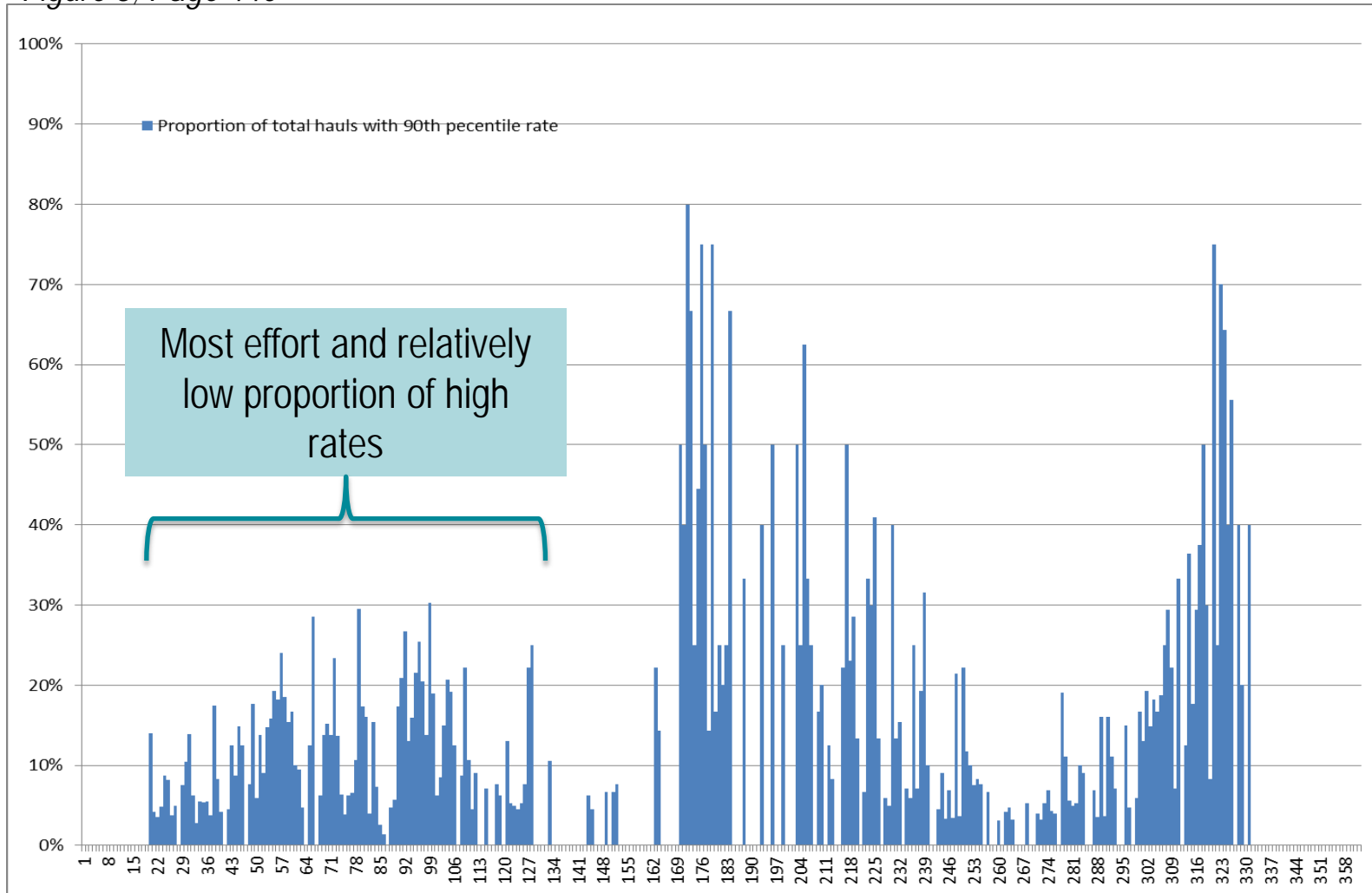
2011-2014 Trawl Limited Access CPs hauls per day / target

Figure 7; Page 439



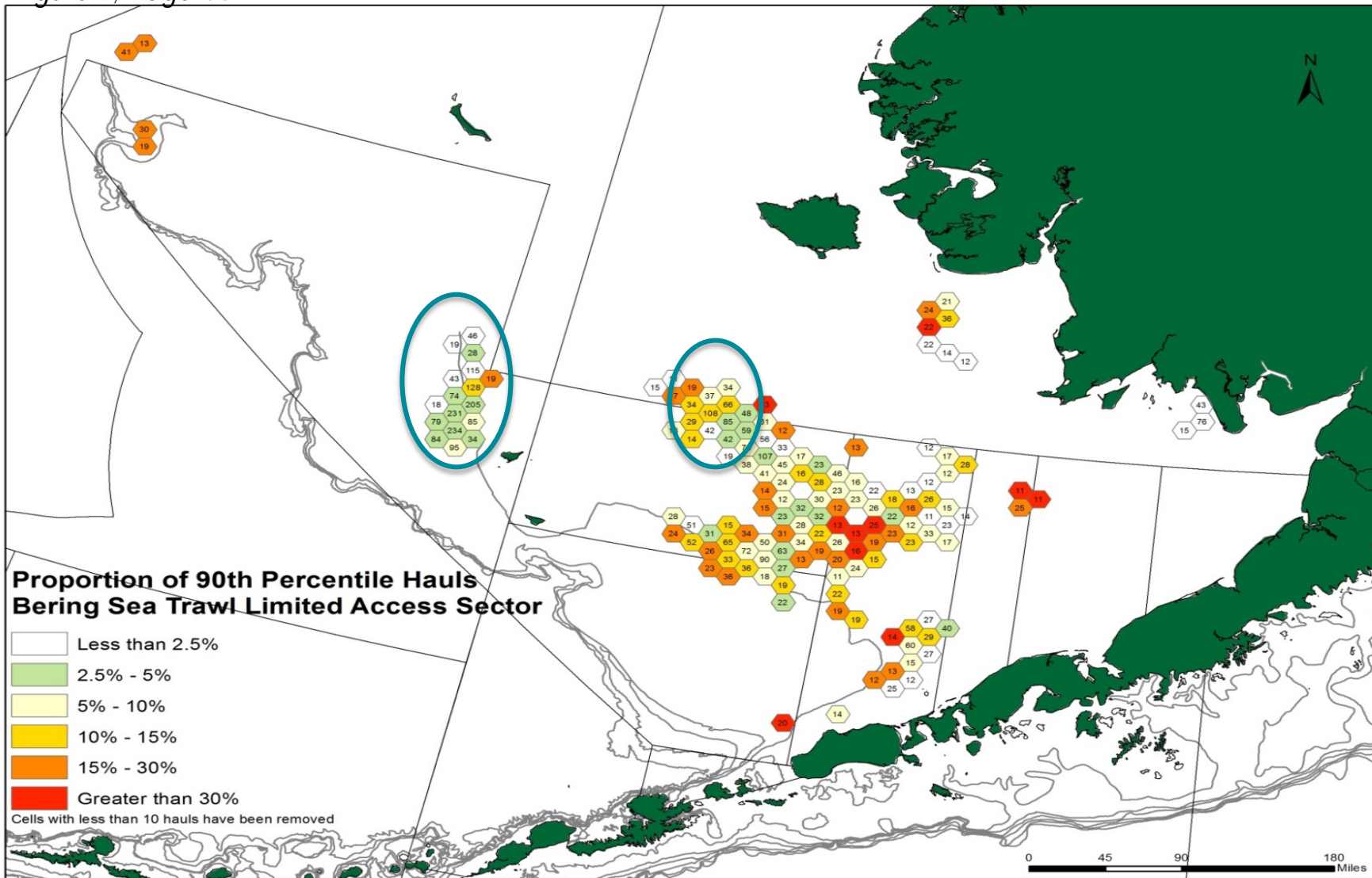
2011-2014 Trawl Limited Access CP proportion of 90th percentile hauls

Figure 8; Page 440



Trawl Limited Access Catcher/Processors

Figure 9; Page 441



Hook-and-Line CP Rates

Table 7; Page 442

	2008	2009	2010	2011	2012	2013	2014	2011-2014
75th	83.74	72.64	73.27	57.11	58.37	56.36	49.33	54.71
76th	87.28	75.06	76.52	59.42	60.33	57.96	51.16	56.88
77th	90.99	78.01	80.31	61.53	62.65	60.21	53.09	58.83
78th	94.94	80.92	83.47	63.69	64.95	62.27	55.03	61.15
79th	98.47	84.56	85.92	66.35	67.56	64.52	57.16	63.40
80th	102.67	87.70	89.10	69.18	70.76	66.40	59.37	65.72
81st	107.29	91.23	92.74	72.12	73.48	68.62	61.70	68.30
82nd	111.43	95.18	96.53	75.35	76.39	71.12	64.11	71.09
83rd	116.25	98.47	101.23	78.80	79.41	74.20	66.72	74.06
84th	121.03	102.28	105.80	82.32	83.18	77.69	69.27	77.31
85th	127.57	106.64	110.81	86.41	87.18	80.85	72.27	80.74
86th	133.61	111.87	116.15	91.76	91.03	83.61	75.44	84.26
87th	140.21	116.80	122.92	96.81	95.73	87.07	78.92	88.45
88th	147.40	122.73	129.06	101.66	100.51	91.61	82.78	93.02
89th	157.72	128.41	135.52	107.64	105.61	96.69	87.13	98.17
90th	167.51	135.25	143.66	115.38	111.74	101.26	91.43	103.83
91st	177.25	144.39	152.61	122.54	119.18	107.58	97.43	110.19
92nd	190.86	155.28	160.93	131.00	126.99	114.31	103.54	118.15
93rd	205.20	164.66	170.51	141.48	139.46	122.09	111.20	127.01
94th	225.09	175.28	182.14	153.14	151.50	131.49	121.18	137.69
95th	248.51	190.87	195.58	170.50	164.23	143.49	132.45	151.22
96th	273.16	210.43	223.17	190.91	183.00	158.02	144.58	168.76
97th	308.26	237.17	250.70	222.95	213.98	178.01	168.60	191.57
98th	362.16	281.83	293.04	265.30	254.34	210.95	200.03	232.68
99th	481.86	369.30	377.60	346.26	338.42	261.25	253.33	299.74

103.83 used in analysis

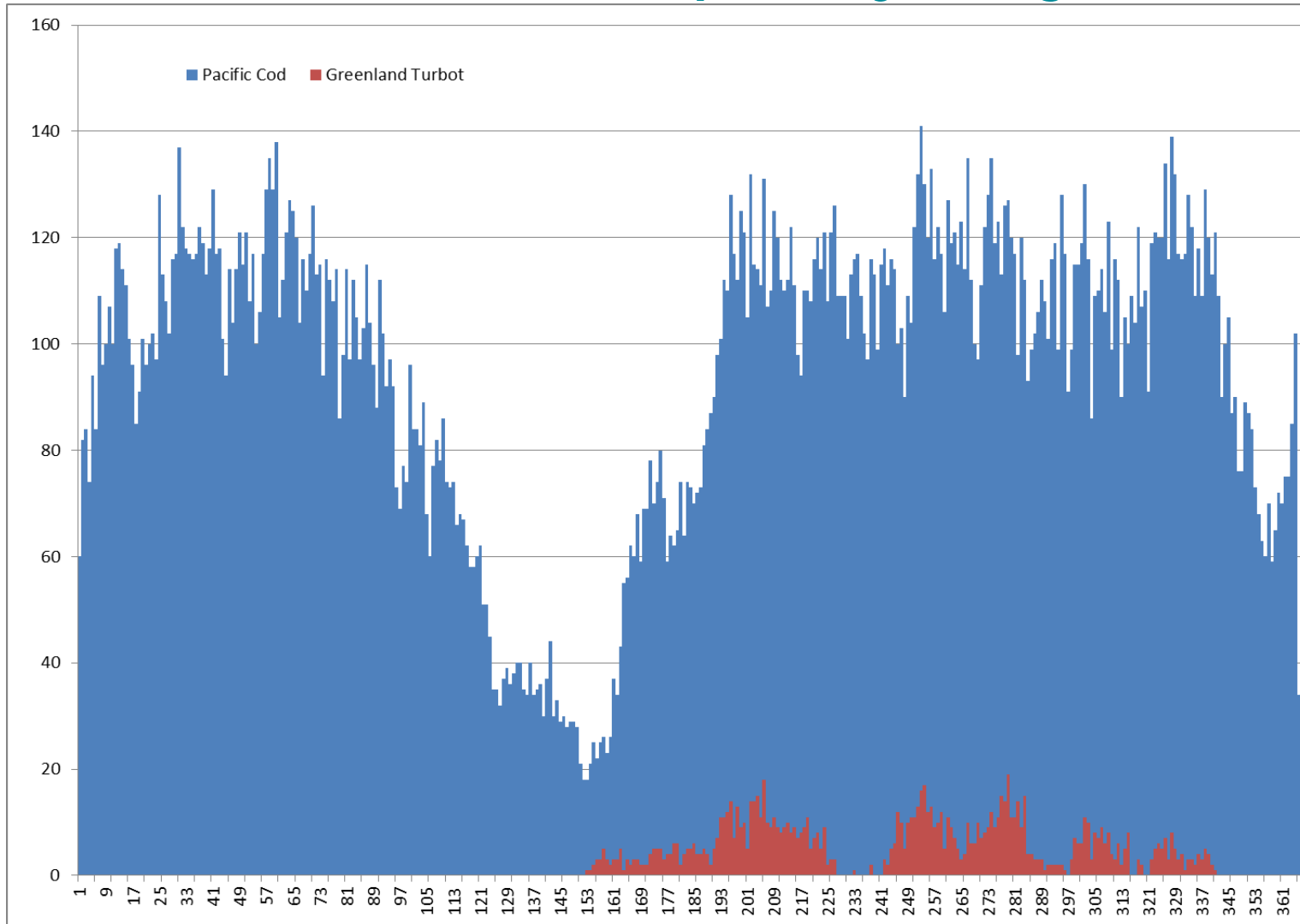
Halibut catch rate of
10.4% of total catch

Total Halibut; Not mortality
DMR for Cod: ~9%

90th percentile mortality is less than 1%

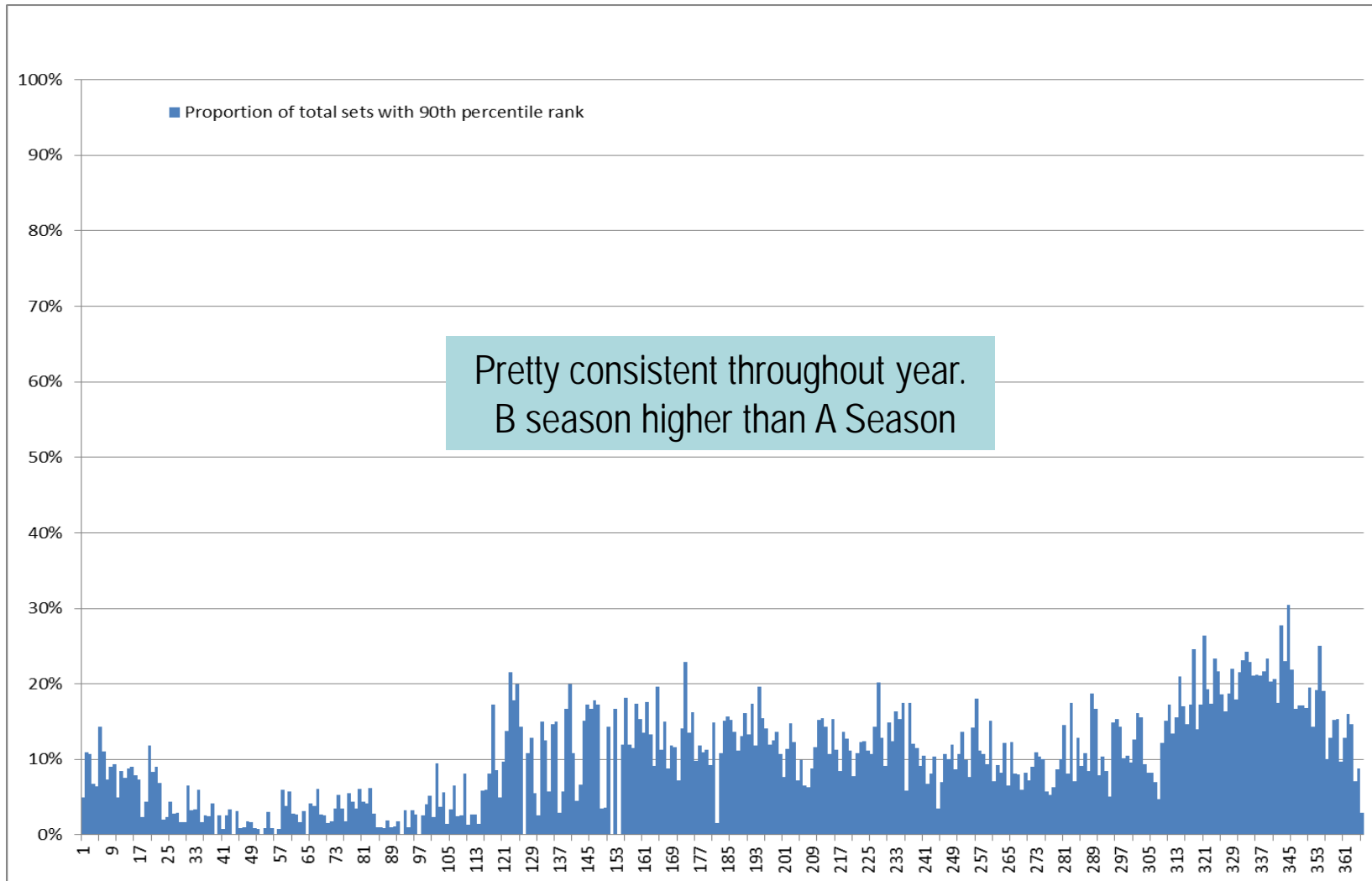
2011-2014 Hook-and-Line CP sets retrieved per day / target

Figure 10; Page 443



2011-2014 Hook-and-line CP proportion of 90th percentile hauls

Figure 11; Page 444



Hook-and-Line CP Vessel Specific Effects?

Table 8; Page 445

	2008	2009	2010	2011	2012	2013	2014
A	15%	12%	7%	10%	7%	12%	17%
B	7%	3%	4%	1%	5%	10%	3%
C	22%	23%	6%	17%	5%	8%	5%
D	18%	32%	19%	2%	4%	2%	10%
E	39%	12%	22%	8%	14%	4%	7%
F	8%	3%	3%	7%	15%	12%	9%
G	7%	11%	0%	8%	3%	16%	14%
H	12%	21%	40%	3%	10%	16%	8%
I	38%	15%	10%	12%	15%	6%	8%
J	3%	20%	12%	25%	20%	8%	3%
K	45%	18%	39%	12%	10%	3%	7%
L	8%	13%	10%	4%	6%	12%	4%
M	45%	28%	42%	19%	22%	8%	5%
N	21%	17%	26%	0%	5%	11%	6%
O	21%	14%	11%	14%	14%	7%	5%
P	36%	21%	26%	26%	29%	15%	11%
Q	6%	8%	3%	3%	3%	11%	1%
R	2%	12%	14%	3%	10%	2%	3%
S	23%	9%	16%	22%	9%	14%	9%
T	0%	0%	0%	9%	14%	17%	8%
U	14%	11%	13%	17%	12%	13%	4%
V	10%	17%	13%	26%	7%	4%	27%
W	10%	9%	1%	16%	9%	14%	9%
X							
Y							
Z	21%	22%	29%	16%	25%	2%	11%

B and Q have good performance in most years in avoiding high rates

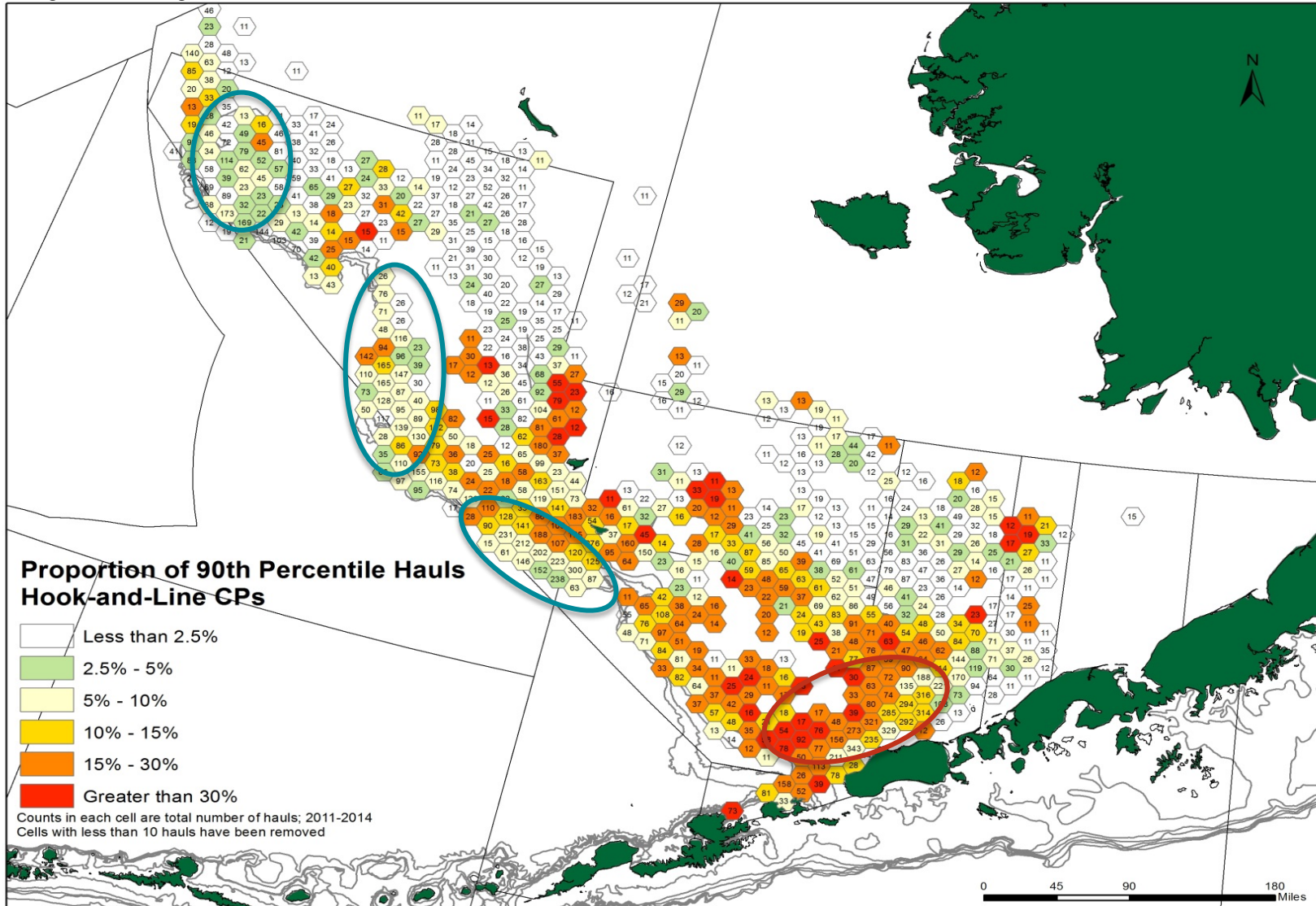
M and P had lower performance in avoiding high rates, but this has improved in recent years.

Indicates that changes are likely being made by hook-and-line CPs to improve avoidance of high halibut rates

Note: Some vessels removed to protect confidentiality

Hook-and-Line Catcher/Processors

Figure 12; Page 446



Conclusions

- Analysis was able to detect that the vessel operators react to halibut rates, however halibut avoidance is not always the primary concern
- Analysis suggests that improvements in halibut avoidance may decrease halibut PSC.
 - More consistent use of halibut avoidance in latter part of year
 - Avoid high rate areas and these areas are driven by target fishery primarily
 - Avoid certain targets (Arrowtooth); use flatfish flexibility (Flathead)
 - Modify time of year when certain targets are pursued. (I.e. swap timing of fisheries to fish some yellowfin sole in first part of year)
 - Potential of additional savings if halibut rate that triggers reaction was lower.
- Analysis notes that there are tradeoffs in halibut avoidance including impacts to incidental catch and cost to vessel operators

Acknowledgements

- Jason Gasper
- Mary Furuness
- Rachel Baker
- Glenn Merrill
- Ben Muse
- Alan Haynie and Matt Reimer
- Industry Members

Discard Mortality Rates are the third component of PSC reduction response p 383

- **Handling practices that reduce the DMR will have the same effect as a reduction in actual bycatch of the same percentage**
- **In practice, however, under the current process, DMRs are based on a 10-year average of observed DMRs by target fishery**
 - Currently based on actual observed DMRs from 2002-2011
- **Work beginning on A80 vessels in the Alaska Seafood Cooperative to test savings from deck sorting in 2015**

Impacts to the Halibut Fishery

- **Halibut fishery impacts provided by sector for each option, and also for all combined (e.g., assuming the Council implemented a consistent 10%, 20%, 30% etc. reduction under each option)**

Harvest impacts to halibut fishery from reductions across all, in pounds p362

Option	Commercial Halibut Fishery Impacts							
	Scenario A				Scenario B			
	4A	4B	4CDE	Area 4	4A	4B	4CDE	Area 4
Average Annual Change from the Status Quo in Commercial Halibut (net weight 1,000s pounds)								
Status Quo	1,576.2	1,382.0	276.1	3,234.3	1,576.6	1,382.8	282.6	3,242.0
All: -10%	25.0	0.4	28.4	53.8	16.6	2.1	58.9	77.6
All: -20%	94.3	2.2	131.8	228.3	41.2	9.8	215.0	266.0
All: -30%	175.7	20.0	301.9	497.6	98.5	24.5	430.5	553.4
All: -35%	207.5	28.7	415.6	651.8	134.5	45.3	556.6	736.4
All: -40%	251.5	38.4	534.5	824.3	171.9	53.2	688.2	913.3
All: -45%	322.9	42.6	652.9	1,018.5	216.3	63.8	835.4	1,115.5
All: -50%	403.3	49.5	758.2	1,210.9	257.0	82.4	985.8	1,325.2

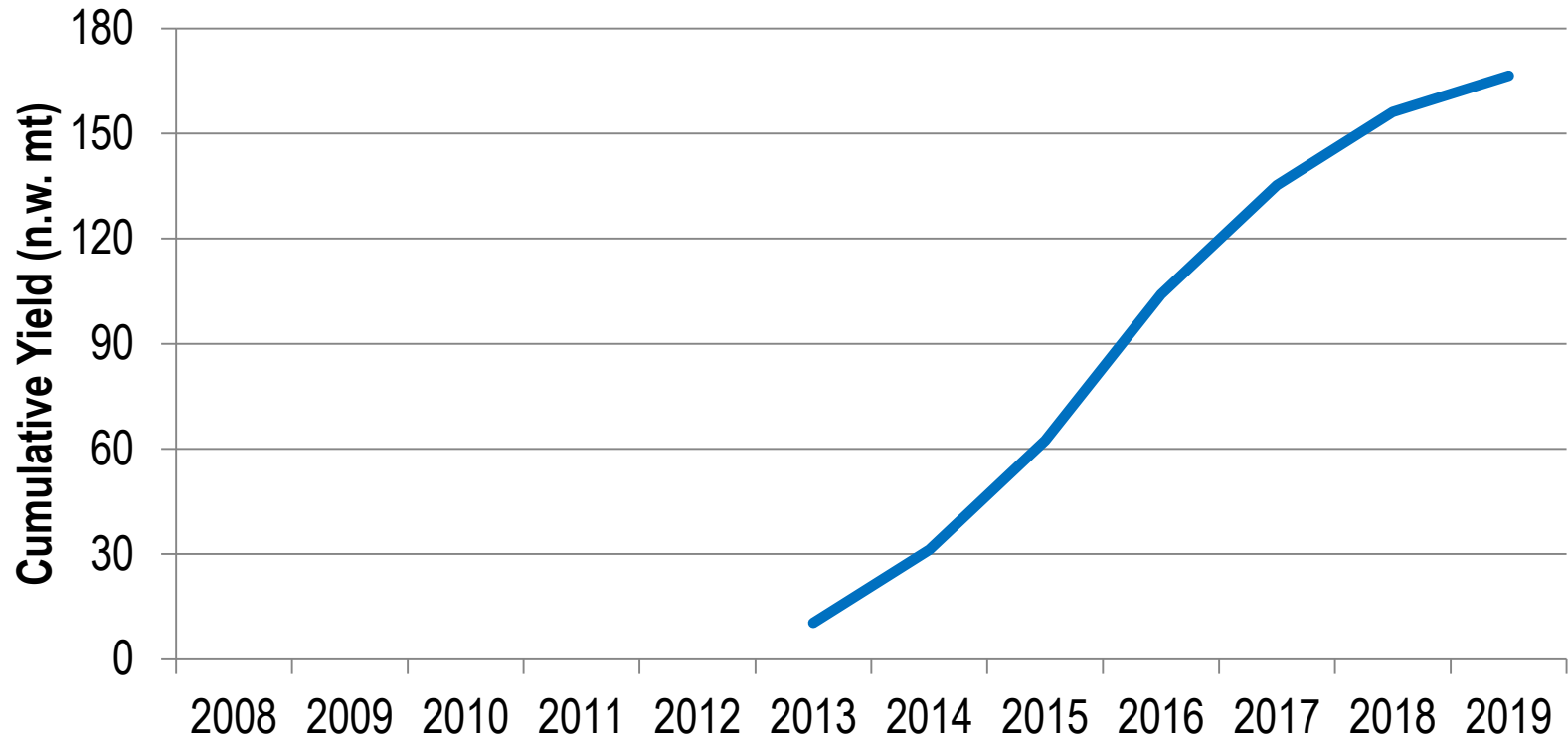
Crew impacts for halibut fishery

- **In the halibut sections, Table 4-94 on p. 221 shows crew participation by vessel owner's region**
 - Northwest Alaska
 - Bristol Bay, Aleutians, Pribilofs
 - Other Alaska (GOA)
 - Other States
 - All Regions

Increased Yields Resulting from U26 Savings (p. 267)

- The coastwide yield increases take over the course of seven years, beginning 5 years after the U26 savings have been realized
- This likely overestimates the benefit from U26 savings, as they would normally be expected to recruit into the fishery over a longer time period

Example of cumulative added yield of 222 round weight mt of U26 PSC savings in 2008 (p 239)



- A total of 166.5 mt of increased yield is realized from 2013 to 2019
- Yield increases are distributed coastwide in proportion to biomass

Impacts coastwide from U26 savings in BSAI

■ Table 4-194, p 366

Option	Area 4	Other AK (GOA)	Areas 2A & 2B	Total U26	Area 4	Other AK (GOA)	Areas 2A & 2B	Total U26
	Scen A - B	Scen A - B	Scen A - B	Scen A - B	Scen A - B	Scen A - B	Scen A - B	Scen A - B
	Mean Annual Increase in Catch (n.w. pounds, 1,000s) over Last Half of the 10-year Future Period				Increased DPV of Wholesale Revenue (2013 millions) over 10-Year Future Period			
Status Quo	138 - 139	400 - 402	79 - 79	618 - 620	\$1.7 - \$1.7	\$4.6 - \$4.6	\$1.0 - \$1.0	\$7.3 - \$7.3
All: -10%	3 - 5	9 - 13	2 - 3	15 - 21	\$0.2 - \$0.2	\$0.4 - \$0.6	\$0.1 - \$0.1	\$0.6 - \$0.9
All: -20%	13 - 15	38 - 44	7 - 9	58 - 68	\$0.6 - \$0.	\$1.6 - \$1.8	\$0.3 - \$0.4	\$2.5 - \$2.9
All: -30%	28 - 32	82 - 92	16 - 18	126 - 142	\$1.3 - \$1.4	\$3.4 - \$3.8	\$0.7 - \$0.8	\$5.4 - \$6.1
All: -35%	37 - 42	106 - 122	21 - 24	164 - 188	\$1.7 - \$1.9	\$4.4 - \$5.1	\$0.9 - \$1.1	\$7.0 - 8.16
All: -40%	46 - 52	134 - 151	26 - 30	207 - 233	\$2.1 - \$2.4	\$5.6 - \$6.3	\$1.2 - \$1.3	\$8.8 - \$10.0
All: -45%	57 - 64	165 - 184	32 - 36	255 - 284	\$2.6 - \$2.9	\$6.9 - \$7.6	\$1.5 - \$1.6	\$10.9 - 12.2
All: -50%	68 - 76	196 - 218	39 - 43	302 - 337	\$3.1 - \$3.4	\$8.1 - \$9.1	\$1.7 - \$1.9	\$12.9 - 14.4

Economic Impacts of Reducing BSAI Halibut PSC Limits

Questions, Comments, Concerns?

Marcus L. Hartley

June 4, 2015

