Discussion Paper: Revisions to the Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska

SDC Review – Alternative 2

NPFMC SSC Meeting

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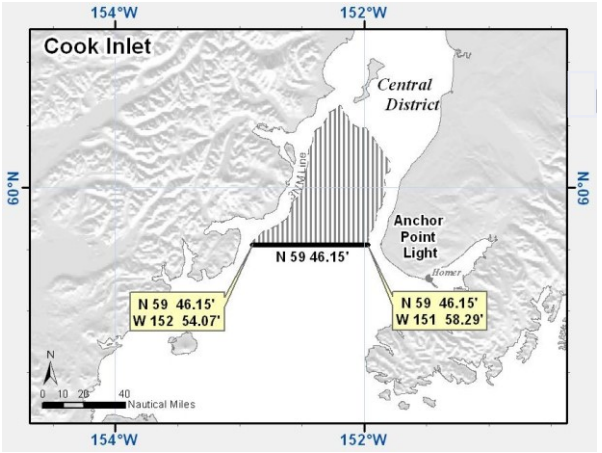
Alternative 2: Cooperative Management with the State

Discussion Paper (March 2019)
section 2.5.2; pg 45



- Salmon stocks caught in Cook Inlet area of EEZ
- Proposed criteria provide starting point
- 3 tiers for SDC and ACLs
- Overfishing definitions based on State of Alaska's MSY escapement goal policies
- Present policies and proposed SDC would prevent overfishing and provide for rebuilding of overfished stocks in the manner and timeframe required by the Magnuson-Stevens Act

Alternative 2: Cooperative Management with the State

If stock or stock complex is declared overfished or if overfishing is occurring:

- The Council will request State of Alaska to:
  - conduct formal assessment of the primary factors leading to the decline in abundance
  - report to the Council the management measures to prevent overfishing and rebuild the fishery
- The Council and NMFS will assess rebuilding measures for compliance with the Magnuson-Stevens Act, including the national standard guidelines
- If proposed rebuilding measures comply with Magnuson-Stevens Act requirements
  - plan may be adopted without FMP amendment to assure timely implementation

Alternative 2: Cooperative Management with the State

Tiers 1 and 2: *Adapted from Salmon FMP - Tier 2 approach in East Area (coho)*

Establishes: MSY control rule
Maximum Fishery Mortality Threshold (MFMT)
Minimum Stock Size Threshold (MSST)
Acceptable Biological Catch (ABC)
Annual Catch Limit (ACL)*

Tier 3: *Similar to Tier 6 federally managed groundfish species*

Establishes: Overfishing Limit (OFL) and ABC (max. catch over specified period)
ADF&G can recommend alternative using best available scientific information

* Council can chose to calculate ACL as in Tier system or use alternative approach (*Discussion Paper, pg 53*)

Proposed Upper Cook Inlet salmon stock in each Tier

Discussion Paper Table 2-1, pg 46

Tier 1

- Kenai River sockeye salmon
- Kasilof River sockeye salmon
- Kenai River late run Chinook salmon

Tier 2

- Upper Cook Inlet coho salmon
- Other Cook Inlet sockeye salmon

Tier 3

- Upper Cook Inlet chum salmon
- Upper Cook Inlet pink salmon

Stocks assigned to tiers annually based on available information

Can change as information improves

Tier 1: Stocks with escapement goals and stock specific catches

Adapted from Salmon FMP - Tier 2 approach in East Area (coho)

- MSY control rule "constant escapement" form:

$$Y_t = max(0, R_t - G_t)$$

- Fishing mortality rate expressed as exploitation rate:

$$F_t = \frac{\sum_{i=t-T+1}^{t} C_i}{\sum_{i=t-T+1}^{t} R_i}$$

- MFMT weighted average of recent exploitation rates corresponding to MSY control rule:

$$MFMT_t = \frac{\sum_{i=t-T+1}^{t} Y_i}{\sum_{i=t-T+1}^{t} R_i}$$, evaluated by comparing with *F*

- If fishing mortality rate > MFMT in any year – stock subjected to overfishing

t = run year
Y = potential yield
R = annual run size of a stock
G = lower bound of escapement goal
T = generation time in years (total age)
C = annual catch of a stock

Tier 1: Stocks with escapement goals and stock specific catches

- If productive capacity < MSST in any year, stock is overfished
  - $MSST_t = \frac{\sum_{i=t-T+1}^{t} G_i}{2}$; evaluated by comparing with $\sum_{i=t-T+1}^{t} S_i$

- MFMT and MSST updated annually with current T years of G, R, C, and S

- $ABC_t = ACL_t = \sum_{i=t-T+1}^{t} Y_i$, evaluated by comparing with $\sum_{i=t-T+1}^{t} C_i$
  - subject to **AM**: $S_t \geq G_t$ for individual years during the same time span
  - Preseason: **ACL** = sum of observed potential yields from previous T-1 years and estimate from preseason forecast of run size
  - Postseason: **ACL** evaluated using all T years of realized runs

S = spawning escapement
Y = potential yield
R = annual run size
G = lower bound of goal
T = generation time in years
C = annual catch of a stock
t = run year

Tier 1 Example – Kenai River sockeye salmon

- *Discussion Paper Table 2-2, pg 48*
- Data 1999-2016
- Catch = total commercial, sport fish, personal use, subsistence harvest
- EEZ catch = 50% drift gillnet fishery harvest
- Esc. = estimated spawning escapement
- Run = Catch + Esc.

- Lower bound escapement goal = 700,000
- Average generation time (T) = 5 yrs.

Year	Catch	EEZ Catch	Esc.	Run
1999	2,035	504	949	2,985
2000	1,118	234	697	1,815
2001	1,451	329	738	2,190
2002	2,340	578	1,127	3,467
2003	3,037	761	1,402	4,440
2004	4,015	1,044	1,691	5,705
2005	4,455	1,082	1,654	6,109
2006	957	117	1,892	2,849
2007	2,638	590	964	3,602
2008	1,374	228	709	2,082
2009	1,582	289	848	2,430
2010	2,558	566	1,038	3,596
2011	4,982	1,243	1,281	6,263
2012	3,557	1,233	1,213	4,770
2013	2,648	648	980	3,628
2014	2,186	526	1,218	3,404
2015	2,419	355	1,400	3,819
2016	2,594	564	1,118	3,712

Data = thousands of fish

Tier 1 Example – Kenai River sockeye salmon

$$\text{Yield}_{\text{EEZ}} = \text{Run} - \text{nonEEZ Catch} - \text{LB esc. goal}$$

$$\text{T(avg. gen. sockeye)} = 5 \text{ yrs.}$$

$$F_{\text{EEZ}} = \frac{\text{sum. EEZ Catch T yrs.}}{\text{sum. Run T yrs.}}$$

$$\text{MFMT}_{\text{EEZ}} = \frac{\text{sum. Yield}_{\text{EEZ}} \text{ T yrs.}}{\text{sum. Run T yrs.}}$$

$$\text{MSST} = \frac{\text{sum. LB esc. goal T yrs.}}{2}$$

$$S = \text{sum. annual esc. T yrs.}$$

$$\text{ACL}_{\text{EEZ}} = \text{sum. Yield}_{\text{EEZ}} \text{ T yrs.}$$

$$C_{\text{EEZ}} = \text{sum. EEZ Catch T yrs.}$$

		EEZ			EEZ					EEZ	
Year	Catch	Catch	Esc.	Run	Yield	F	MFMT	MSST	S	ACL	C
1999	2,035	504	949	2,985	753						
2000	1,118	234	697	1,815	231						
2001	1,451	329	738	2,190	367						
2002	2,340	578	1,127	3,467	1,004						
2003	3,037	761	1,402	4,440	1,463	0.162	0.256	1,750	4,913	3,819	2,406
2004	4,015	1,044	1,691	5,705	2,035	0.167	0.290	1,750	5,655	5,101	2,946
2005	4,455	1,082	1,654	6,109	2,036	0.173	0.315	1,750	6,612	6,906	3,794
2006	957	117	1,892	2,849	1,309	0.159	0.348	1,750	7,766	7,848	3,582
2007	2,638	590	964	3,602	854	0.158	0.339	1,750	7,603	7,698	3,594
2008	1,374	228	709	2,082	237	0.150	0.318	1,750	6,910	6,472	3,062
2009	1,582	289	848	2,430	437	0.135	0.285	1,750	6,067	4,874	2,307
2010	2,558	566	1,038	3,596	904	0.123	0.257	1,750	5,452	3,742	1,790
2011	4,982	1,243	1,281	6,263	1,824	0.162	0.237	1,750	4,840	4,257	2,916
2012	3,557	1,233	1,213	4,770	1,746	0.186	0.269	1,750	5,089	5,148	3,559
2013	2,648	648	980	3,628	928	0.192	0.282	1,750	5,360	5,839	3,979
2014	2,186	526	1,218	3,404	1,044	0.195	0.298	1,750	5,731	6,446	4,216
2015	2,419	355	1,400	3,819	1,055	0.183	0.301	1,750	6,092	6,597	4,005
2016	2,594	564	1,118	3,712	982	0.172	0.298	1,750	5,930	5,755	3,326

Data = thousands of fish

Tier 1 Example – Kenai River sockeye salmon

Is stock subjected to overfishing?

$F_{EEZ} > MFMT_{EEZ}$?

Is stock overfished?

S (productive capacity) < MSST?

Is ACL exceeded?

$C_{EEZ} > ACL_{EEZ}$?

Based on example:

- Overfishing not observed
- Overfished status not observed
- ACL not exceeded

	EEZ				EEZ				
Year	F	MFMT	MSST	S	ACL	C	Overfishing?	Overfished?	ACL Exceeded?
1999									
2000									
2001									
2002									
2003	0.162	0.256	1,750	4,913	3,819	2,406	No	No	No
2004	0.167	0.290	1,750	5,655	5,101	2,946	No	No	No
2005	0.173	0.315	1,750	6,612	6,906	3,794	No	No	No
2006	0.159	0.348	1,750	7,766	7,848	3,582	No	No	No
2007	0.158	0.339	1,750	7,603	7,698	3,594	No	No	No
2008	0.150	0.318	1,750	6,910	6,472	3,062	No	No	No
2009	0.135	0.285	1,750	6,067	4,874	2,307	No	No	No
2010	0.123	0.257	1,750	5,452	3,742	1,790	No	No	No
2011	0.162	0.237	1,750	4,840	4,257	2,916	No	No	No
2012	0.186	0.269	1,750	5,089	5,148	3,559	No	No	No
2013	0.192	0.282	1,750	5,360	5,839	3,979	No	No	No
2014	0.195	0.298	1,750	5,731	6,446	4,216	No	No	No
2015	0.183	0.301	1,750	6,092	6,597	4,005	No	No	No
2016	0.172	0.298	1,750	5,930	5,755	3,326	No	No	No

Data = thousands of fish

Tier 1 Example – Kenai River sockeye salmon

Accountability Measure ($S_t < G_t$)

- Escapement < 700,000 in 2000
- Escapement goal not met

If implemented, criteria would be applied annually using best available scientific information during stock status determination process

Year	Catch	EEZ Catch	Esc.	Run
1999	2,035	504	949	2,985
2000	1,118	234	697	1,815
2001	1,451	329	738	2,190
2002	2,340	578	1,127	3,467
2003	3,037	761	1,402	4,440
2004	4,015	1,044	1,691	5,705
2005	4,455	1,082	1,654	6,109
2006	957	117	1,892	2,849
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2011	4,982	1,243	1,281	6,263
2012	3,557	1,233	1,213	4,770
2013	2,648	648	980	3,628
2014	2,186	526	1,218	3,404
2015	2,419	355	1,400	3,819
2016	2,594	564	1,118	3,712

Data = thousands of fish

Tier 2: Salmon stocks managed as a complex

Similar to Tier 1

Specific salmon stocks as indicator stocks

Indicator stock:

- measurable and objective SDC
- used to manage and evaluate more poorly known stocks in stock complex
- represent typical vulnerabilities of stocks within complex
- management based on aggregate abundance
- lack of stock identification prevents assessment of run strength of individual stock groups contributing to mixed stock fisheries
- Information available on individual indicator stocks is considered in management actions

Tier 2: Salmon stocks managed as a complex

- MSY control rule "constant escapement" form
  - Different from Tier 1 in level of aggregation (not form)
- List of "indicator" salmon stocks for complex established if estimates of F or MFMT, as defined under Tier 1, are unavailable
- Determination that indicator stock(s) subjected to overfishing
  - Uses the same definitions and criteria for Tier 1
  - Determination applies to the respective stock complex, **except…**
    - under the following conditions (50 CFR §600.310(l)):
      - demonstrate action will result in long-term net benefits to the Nation
      - demonstrate mitigating measures have been considered and similar benefits cannot be achieved by modifying fleet behavior, gear selection/configuration, or other technical characteristics in a manner such that no overfishing would occur
      - resulting fishing mortality will not result in stock or stock complex to fall below MSST > 50% long term.

Tier 2: Salmon stocks managed as a complex

- Productive capacity of a stock complex:
  - sum of indicator stocks' escapements from most recent T years
  - T = average generation time (total age)

- MSST for a stock complex:
  - one-half the sum of the indicator salmon stocks' MSY escapement goals from most recent T years

- If stock complex's productive capacity < MSST in any year:
  - stock complex is overfished

- MSY for stock complex could be listed as unknown
  - note that stock complex managed on basis of indicator stock(s) that have stock-specific MSYs or suitable proxies

Tier 2 Example – Upper Cook Inlet coho salmon

- *Discussion Paper Table 2-3, pg 51*
- Catch = total UCI commercial, sport fish, personal use harvest (not stock-specific)
- EEZ catch = 50% drift gillnet fishery harvest
- Esc. = estimated spawning escapement
- Lower bound escapement goals:
  - Deshka = 10,200
  - Little Susitna = 10,100
- Run = Catch + Esc. indicator stocks
- Average generation time (T) = 4 yrs.

Year	Catch	EEZ Catch	Escapement			Run
			Deshka	Little Susitna	Total	
1999	257,059	32,407	4,566	3,017	7,583	264,642
2000	442,339	65,739	26,387	15,436	41,823	484,162
2001	318,113	19,709	29,927	30,587	60,514	378,627
2002	462,865	62,916	24,612	47,938	72,550	535,415
2003	260,098	26,216	17,305	10,877	28,182	288,280
2004	508,137	99,794	62,940	40,199	103,139	611,276
2005	387,370	72,377	47,887	16,839	64,726	452,096
2006	357,866	49,237	59,419	8,786	68,205	426,071
2007	313,565	54,352	10,575	17,573	28,148	341,713
2008	353,360	44,714	12,724	18,485	31,209	384,569
2009	312,133	41,048	27,348	9,523	36,871	349,004
2010	351,090	55,138	10,393	9,214	19,607	370,697
2011	203,240	20,429	7,508	4,826	12,334	215,574
2012	197,371	37,339	6,825	6,779	13,604	210,975
2013	382,142	92,386	22,341	13,583	35,924	418,066
2014	279,201	38,466	11,578	24,211	35,789	314,990
2015	375,990	65,360	10,775	12,756	23,531	399,521
2016	230,816	45,121	6,820	10,049	16,869	247,685

Tier 2 Example – Upper Cook Inlet coho salmon

Calcs. same as Tier 1

T (avg. gen. coho) = 4 yrs.

Proxies:

- Run
- Potential Yield$_{EEZ}$
- F_{EEZ}
- $MFMT_{EEZ}$
- MSST
- S

		EEZ	Esc.		EEZ					EEZ	
Year	Catch	Catch	Total	Run	Yield	F	MFMT	MSST	S	ACL	C
1999	257,059	32,407	7,583	264,642	19,690						
2000	442,339	65,739	41,823	484,162	87,262						
2001	318,113	19,709	60,514	378,627	59,923						
2002	462,865	62,916	72,550	535,415	115,166	0.109	0.170	40,600	182,470	282,041	180,771
2003	260,098	26,216	28,182	288,280	34,098	0.104	0.176	40,600	203,069	296,449	174,580
2004	508,137	99,794	103,139	611,276	182,633	0.115	0.216	40,600	264,385	391,819	208,634
2005	387,370	72,377	64,726	452,096	116,803	0.138	0.238	40,600	268,597	448,699	261,302
2006	357,866	49,237	68,205	426,071	97,142	0.139	0.242	40,600	264,252	430,675	247,623
2007	313,565	54,352	28,148	341,713	62,200	0.151	0.251	40,600	264,218	458,776	275,758
2008	353,360	44,714	31,209	384,569	55,623	0.138	0.207	40,600	192,288	331,767	220,679
2009	312,133	41,048	36,871	349,004	57,619	0.126	0.182	40,600	164,433	272,583	189,350
2010	351,090	55,138	19,607	370,697	54,445	0.135	0.159	40,600	115,835	229,886	195,251
2011	203,240	20,429	12,334	215,574	12,463	0.122	0.136	40,600	100,021	180,150	161,329
2012	197,371	37,339	13,604	210,975	30,643	0.134	0.135	40,600	82,416	155,170	153,954
2013	382,142	92,386	35,924	418,066	108,010	0.169	0.169	40,600	81,469	205,560	205,291
2014	279,201	38,466	35,789	314,990	53,955	0.163	0.177	40,600	97,651	205,071	188,620
2015	375,990	65,360	23,531	399,521	68,591	0.174	0.194	40,600	108,848	261,199	233,551
2016	230,816	45,121	16,869	247,685	41,690	0.175	0.197	40,600	112,113	272,246	241,333

Tier 2 Example – Upper Cook Inlet coho salmon

Is stock subjected to overfishing?

$F_{EEZ} > MFMT_{EEZ}$?

Is stock overfished?

S (productive capacity) < MSST?

Is ACL exceeded?

$C_{EEZ} > ACL_{EEZ}$?

2013 F_{EEZ} nearly equal $MFMT_{EEZ}$

	EEZ				EEZ				ACL
Year	F	MFMT	MSST	S	ACL	C	Overfishing?	Overfished?	Exceeded?
1999									
2000									
2001									
2002	0.109	0.170	40,600	182,470	282,041	180,771	No	No	No
2003	0.104	0.176	40,600	203,069	296,449	174,580	No	No	No
2004	0.115	0.216	40,600	264,385	391,819	208,634	No	No	No
2005	0.138	0.238	40,600	268,597	448,699	261,302	No	No	No
2006	0.139	0.242	40,600	264,252	430,675	247,623	No	No	No
2007	0.151	0.251	40,600	264,218	458,776	275,758	No	No	No
2008	0.138	0.207	40,600	192,288	331,767	220,679	No	No	No
2009	0.126	0.182	40,600	164,433	272,583	189,350	No	No	No
2010	0.135	0.159	40,600	115,835	229,886	195,251	No	No	No
2011	0.122	0.136	40,600	100,021	180,150	161,329	No	No	No
2012	0.134	0.135	40,600	82,416	155,170	153,954	No	No	No
2013	0.169	0.169	40,600	81,469	205,560	205,291	No	No	No
2014	0.163	0.177	40,600	97,651	205,071	188,620	No	No	No
2015	0.174	0.194	40,600	108,848	261,199	233,551	No	No	No
2016	0.175	0.197	40,600	112,113	272,246	241,333	No	No	No

Tier 2 Example – Upper Cook Inlet coho salmon

Accountability Measure ($S_t < G_t$)

- Individual escapement goals not met some years

If implemented, criteria would be applied annually using best available scientific information during stock status determination process

Year	Catch	EEZ Catch	Escapement			Run
			Deshka	Little Susitna	Total	
1999	257,059	32,407	4,566	3,017	7,583	264,642
2000	442,339	65,739	26,387	15,436	41,823	484,162
2001	318,113	19,709	29,927	30,587	60,514	378,627
2002	462,865	62,916	24,612	47,938	72,550	535,415
2003	260,098	26,216	17,305	10,877	28,182	288,280
2004	508,137	99,794	62,940	40,199	103,139	611,276
2005	387,370	72,377	47,887	16,839	64,726	452,096
2006	357,866	49,237	59,419	8,786	68,205	426,071
2007	313,565	54,352	10,575	17,573	28,148	341,713
2008	353,360	44,714	12,724	18,485	31,209	384,569
2009	312,133	41,048	27,348	9,523	36,871	349,004
2010	351,090	55,138	10,393	9,214	19,607	370,697
2011	203,240	20,429	7,508	4,826	12,334	215,574
2012	197,371	37,339	6,825	6,779	13,604	210,975
2013	382,142	92,386	22,341	13,583	35,924	418,066
2014	279,201	38,466	11,578	24,211	35,789	314,990
2015	375,990	65,360	10,775	12,756	23,531	399,521
2016	230,816	45,121	6,820	10,049	16,869	247,685

Tier 3: Salmon stocks with no reliable estimates of escapement

- based on reliable catch history
- similar to Tier 6 federally managed groundfish species
- only OFL and ABC set
- MSST cannot be estimated without escapement*

Proposed:

OFL = max. catch * T years (unless alternative value established)

ABC < OFL * 0.9 (to buffer for uncertainty)

Annual stock status determination decisions:

1) Which stocks belong in Tier 3?
2) What are the appropriate years to use for maximum catch?
3) Does the best available scientific information indicate an alternative value should be set for OFL?
4) What is the appropriate buffer for uncertainty in setting the ABC?

*escapements monitored at weirs, etc., but do not have complete estimate for season

Tier 3: Salmon stocks with no reliable estimates of escapement

- Because OFL is limit on catch, catch history is most appropriate to set OFL when there are no reliable estimates of escapement

- For salmon, summary of catches can be reliably used as an OFL due to multiple year nature of accumulation of catch data (e.g., 4 years for chum)

- Long period of sustained catches is evidence that overfishing is not occurring
  - Methods that use CPUE (e.g., catch per delivery) would likely not provide sufficient information to judge whether catches exceed a level thought to cause overfishing

Tier 3 Example – Upper Cook Inlet chum salmon

- Evaluated status from 2002 to 2016
- EEZ catch assumed 50% total Central District drift gillnet harvest
- OFL and ABC developed using maximum catch in EEZ 1999-2016
  - Reasoning:
    - 1999-2016 – advent of current abundance-based approach to management of sockeye salmon, likely limits chum catches independent of stock status
    - maximum catch – incidental nature of chum catches (i.e., no additional fishing time directed specifically at chum)
  - other time periods and methods of summarizing the catch data could be used

Tier 3 Example – Upper Cook Inlet chum salmon

- *Discussion Paper Table 2-4, pg 53*
- Catch = total CF, SF, PU harvests
- EEZ catch[1] = Drift gillnet catch * 0.5
- Max. EEZ catch = 132,527
- T (avg. gen.) = 4 yrs.
- OFL_{EEZ} = 132,257 * 4 = 529,026
- ABC_{EEZ} = 529,026 * 0.9 = 472,123
- ABC not exceed 2002-2016

If implemented, criteria would be applied annually using best available scientific information during stock status determination process

		EEZ	EEZ			
Year	Catch	Catch	OFL	ABC	Catch	ABC Exceeded?
1999	179,636	83,306				
2000	133,920	59,037				
2001	90,961	37,800				
2002	245,783	112,294	529,026	476,123	292,436	No
2003	126,158	53,234	529,026	476,123	262,364	No
2004	151,346	68,521	529,026	476,123	271,848	No
2005	73,992	32,836	529,026	476,123	266,884	No
2006	67,848	29,983	529,026	476,123	184,573	No
2007	79,916	37,418	529,026	476,123	168,757	No
2008	54,082	23,005	529,026	476,123	123,241	No
2009	86,817	38,537	529,026	476,123	128,942	No
2010	233,038	108,489	529,026	476,123	207,448	No
2011	134,114	55,541	529,026	476,123	225,571	No
2012	274,217	132,257	529,026	476,123	334,823	No
2013	145,038	66,086	529,026	476,123	362,372	No
2014	122,770	54,173	529,026	476,123	308,056	No
2015	281,694	126,166	529,026	476,123	378,681	No
2016	127,623	56,629	529,026	476,123	303,053	No

[1] Assumed 50% of Central District drift gillnet fishery catch occurred in EEZ

Proposed Upper Cook Inlet salmon stock in each Tier

Tier 1

- Kenai River sockeye salmon
- Kasilof River sockeye salmon
- Kenai River late run Chinook salmon

Tier 2

- Upper Cook Inlet coho salmon
- Other Cook Inlet sockeye salmon

Tier 3

- Upper Cook Inlet chum salmon
- Upper Cook Inlet pink salmon

Stocks assigned to tiers annually based on available information
Can change as information improves

Conclusions

- Proposed criteria and examples provide starting point
- Method used for SDCs in current Salmon FMP in East Area Tier 2 stocks
- Accumulation of catches and run sizes over life cycle acknowledges entire stock not available to fishery each year, rather than assessing status for a single run year
- Method of determining MSY-based escapement goal (ADF&G EG teams with potential 3rd party peer review) is the means to address uncertainty in assessing status relative to MSY
- Tier system similar to groundfish and crab SDCs except…
  - status relative to achievement of lower bound of MSY-based escapement goal
  - rather than achievement of less than MSY as catch
- If implemented, criteria applied annually using best available scientific information during stock status determination process