

# Analysis of Management Options for the Area 2C and 3A Charter Halibut Fisheries for 2013

For the North Pacific Fishery Management Council  
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# Overview

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- ▶ Area 2C

- ▶ Requested analyses:

- ▶ Reverse slot limits (e.g. U45O68)

- ▶ Maximum size limit ( $L_{\max}$ ) with annual limit of one fish  $> L_{\max}$

- ▶ Area 3A

- ▶ Crew harvest prohibition

# Goal

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- ▶ Identify viable management measures for 2013 that constrain harvest under possible GHGs (IPHC “blue line” alternatives):
  - ▶ Area 2C - 0.788 M lb
  - ▶ Area 3A - 2.373 M lb



# Area 2C – Harvest Forecasts

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- ▶ ARIMA model identification and evaluation
- ▶ Projected using 2011-2012 rate of change
- ▶ Forecast effort and apportion using annual harvest distributions (logbook data)

# Area 2C – Harvest Forecasts

Method	Forecast (no. fish)	Std Err
Time Series	44,352	8,696
Continued rate of change	54,908	12,596
Forecast effort and annual harvest distribution	47,148	none

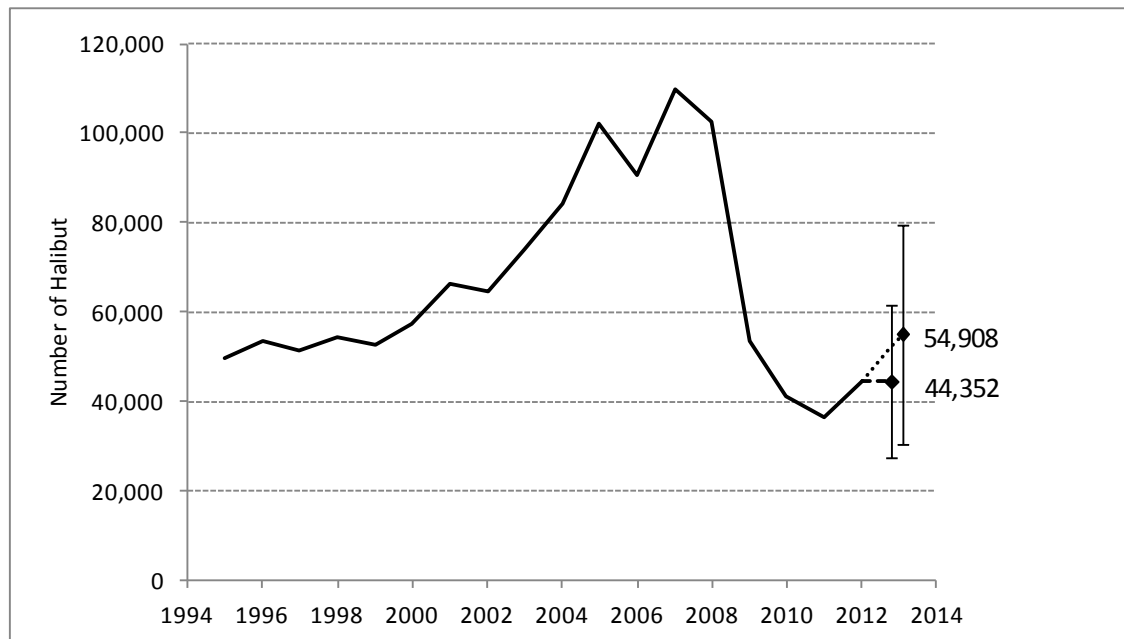
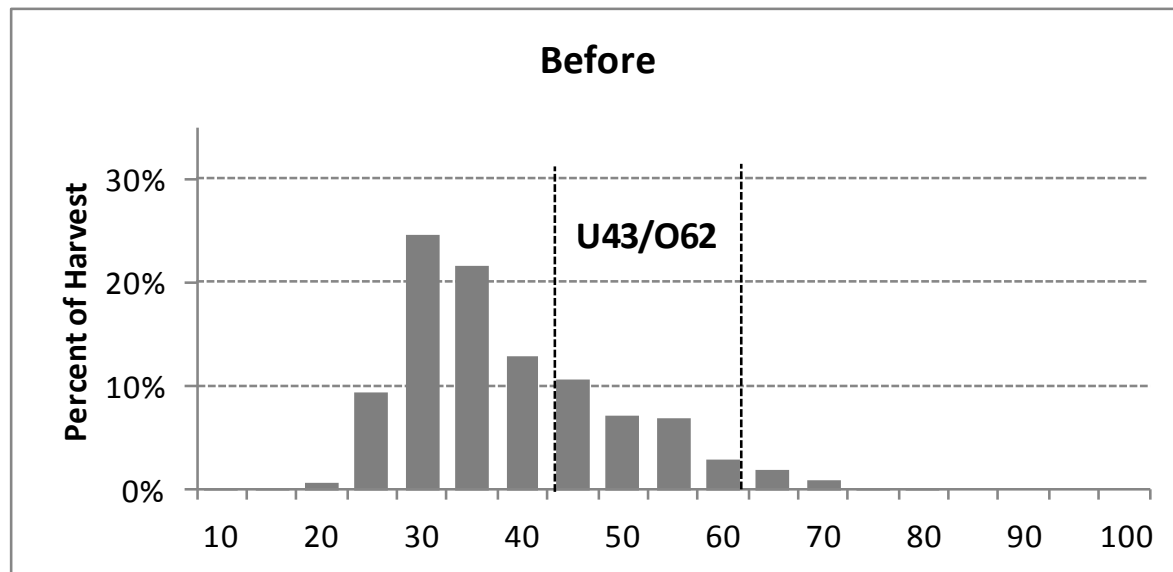


Table 1, Figure 1

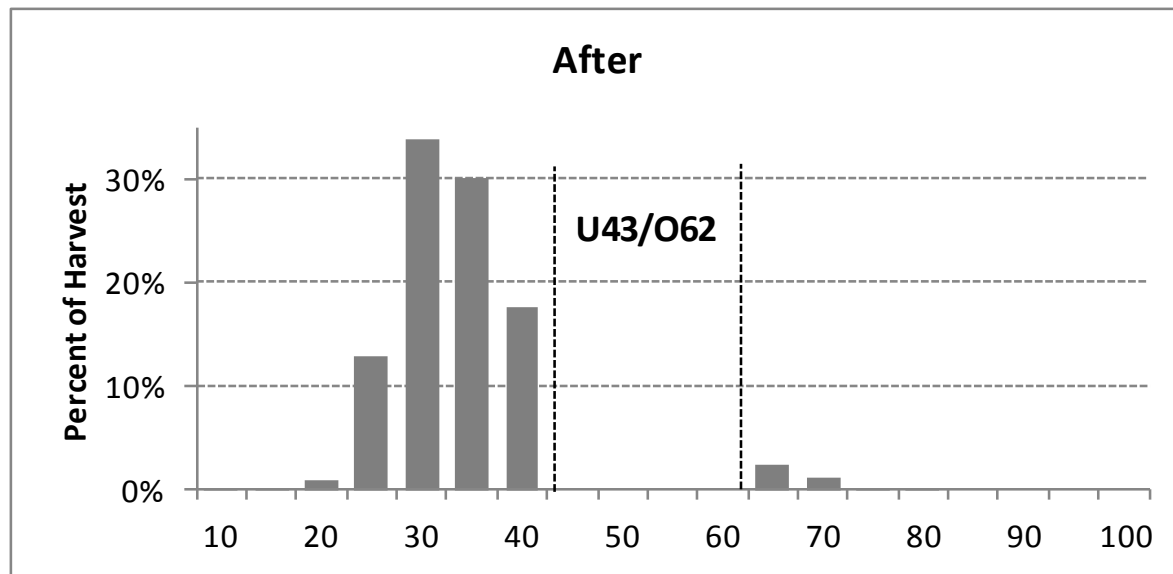
# Area 2C – Reverse Slot Limit

- ▶ Assume harvest will have length distribution similar to 2010
- ▶ Assume size limit has no effect on number of fish harvested  
Fish caught in the protected slot will be released and replaced in the harvest with legal-size fish, in same relative distribution as in 2010.



# Area 2C – Reverse Slot Limit

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# Area 2C – Reverse Slot Limit

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- ▶ Average weight projections by subarea.

	u45o68w		
Subarea	AverageWt	Harvest	Yield
Ketchikan	14.770	4,673	69,020
Pr. Wales I.	10.673	10,311	110,048
Pburg	23.546	2,139	50,364
Sitka	15.653	16,076	251,633
Juneau	13.761	4,045	55,658
Glac Bay	36.565	7,108	259,906
Area 2C	17.966	44,352	796,800



# Area 2C – Reverse Slot Limit

► Yield table for harvest = 44,352

		Upper Length Limit (in)															
		50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
Lower Length Limit (in)	35	1.280	1.260	1.229	1.180	1.140	1.099	1.033	0.944	0.891	0.831	0.771	0.731	0.676	0.642	0.633	0.595
	36	1.235	1.212	1.181	1.133	1.094	1.054	0.991	0.909	0.861	0.808	0.754	0.720	0.672	0.642	0.633	0.599
	37	1.207	1.183	1.151	1.104	1.064	1.024	0.963	0.884	0.839	0.789	0.739	0.707	0.664	0.635	0.628	0.597
	38	1.179	1.154	1.120	1.074	1.034	0.995	0.936	0.861	0.819	0.774	0.728	0.700	0.661	0.635	0.628	0.601
	39	1.166	1.140	1.108	1.063	1.024	0.985	0.929	0.857	0.817	0.775	0.732	0.705	0.668	0.644	0.638	0.612
	40	1.148	1.122	1.090	1.045	1.008	0.970	0.915	0.847	0.809	0.770	0.730	0.705	0.671	0.649	0.643	0.619
	41	1.135	1.108	1.076	1.032	0.995	0.959	0.906	0.841	0.805	0.769	0.732	0.708	0.677	0.656	0.651	0.630
	42	1.124	1.097	1.065	1.023	0.986	0.950	0.899	0.837	0.802	0.768	0.733	0.711	0.682	0.662	0.657	0.638
	43	1.118	1.091	1.060	1.018	0.983	0.948	0.897	0.838	0.805	0.773	0.739	0.719	0.691	0.672	0.668	0.649
	44	1.117	1.090	1.060	1.019	0.985	0.952	0.903	0.846	0.814	0.783	0.752	0.732	0.706	0.688	0.684	0.666
	45	1.118	1.092	1.062	1.023	0.990	0.958	0.911	0.856	0.826	0.797	0.766	0.748	0.723	0.706	0.702	0.685
	46	1.119	1.093	1.064	1.026	0.994	0.962	0.916	0.863	0.834	0.806	0.777	0.759	0.734	0.718	0.714	0.698
	47	1.122	1.097	1.068	1.031	1.000	0.969	0.925	0.874	0.845	0.819	0.791	0.774	0.750	0.735	0.731	0.716
	48	1.126	1.102	1.074	1.038	1.007	0.977	0.933	0.884	0.856	0.830	0.803	0.786	0.763	0.748	0.745	0.730
	49	1.134	1.110	1.083	1.047	1.017	0.988	0.946	0.898	0.872	0.847	0.821	0.805	0.783	0.769	0.766	0.752
	50	1.140	1.117	1.090	1.056	1.027	0.999	0.957	0.911	0.885	0.862	0.837	0.821	0.800	0.786	0.783	0.770

Table 4

# Area 2C – Reverse Slot Limit

► Yield table for harvest = 54,908

		Upper Length Limit (in)															
		50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
Lower Length Limit (in)	35	1.585	1.558	1.520	1.460	1.414	1.362	1.279	1.167	1.103	1.025	0.953	0.905	0.834	0.793	0.782	0.735
	36	1.528	1.498	1.459	1.402	1.355	1.305	1.227	1.123	1.066	0.998	0.933	0.891	0.831	0.793	0.783	0.741
	37	1.494	1.463	1.422	1.365	1.319	1.268	1.192	1.092	1.038	0.974	0.914	0.875	0.820	0.786	0.776	0.738
	38	1.458	1.425	1.384	1.328	1.282	1.232	1.159	1.065	1.014	0.956	0.902	0.867	0.818	0.786	0.778	0.745
	39	1.442	1.409	1.368	1.314	1.268	1.220	1.149	1.060	1.012	0.958	0.906	0.873	0.828	0.798	0.790	0.759
	40	1.420	1.386	1.346	1.292	1.248	1.201	1.132	1.047	1.002	0.952	0.904	0.874	0.832	0.804	0.797	0.768
	41	1.403	1.369	1.329	1.276	1.233	1.187	1.121	1.040	0.997	0.951	0.907	0.879	0.840	0.814	0.808	0.781
	42	1.390	1.355	1.316	1.264	1.221	1.177	1.112	1.035	0.994	0.950	0.908	0.882	0.845	0.821	0.816	0.791
	43	1.382	1.348	1.309	1.258	1.217	1.173	1.110	1.036	0.996	0.956	0.916	0.891	0.856	0.833	0.828	0.805
	44	1.381	1.347	1.309	1.260	1.220	1.178	1.117	1.047	1.008	0.970	0.932	0.909	0.875	0.853	0.848	0.827
	45	1.382	1.349	1.313	1.265	1.227	1.186	1.127	1.059	1.023	0.986	0.950	0.928	0.896	0.875	0.871	0.850
	46	1.384	1.351	1.315	1.269	1.231	1.191	1.134	1.069	1.033	0.998	0.963	0.941	0.911	0.891	0.886	0.866
	47	1.388	1.356	1.321	1.276	1.239	1.201	1.145	1.083	1.048	1.015	0.982	0.961	0.932	0.913	0.909	0.890
	48	1.394	1.363	1.329	1.285	1.249	1.211	1.157	1.095	1.062	1.029	0.997	0.977	0.948	0.930	0.925	0.907
	49	1.403	1.372	1.339	1.296	1.261	1.225	1.172	1.113	1.081	1.050	1.019	1.000	0.973	0.955	0.951	0.934
	50	1.411	1.381	1.349	1.307	1.273	1.238	1.186	1.129	1.098	1.068	1.039	1.020	0.994	0.977	0.973	0.957

Table 5

# Area 2C – Reverse Slot Limit

► Yield table for harvest = 47,148

		Upper Length Limit (in)															
		50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
Lower Length Limit (in)	35	1.379	1.361	1.334	1.287	1.248	1.207	1.139	1.047	0.993	0.929	0.861	0.820	0.763	0.722	0.710	0.663
	36	1.332	1.313	1.284	1.238	1.200	1.158	1.093	1.007	0.957	0.900	0.838	0.802	0.753	0.715	0.704	0.662
	37	1.302	1.281	1.251	1.205	1.166	1.124	1.059	0.976	0.929	0.875	0.818	0.784	0.739	0.704	0.694	0.656
	38	1.271	1.247	1.216	1.171	1.131	1.089	1.026	0.947	0.903	0.854	0.802	0.771	0.730	0.699	0.691	0.657
	39	1.257	1.233	1.202	1.158	1.119	1.078	1.017	0.941	0.899	0.853	0.803	0.775	0.736	0.706	0.698	0.667
	40	1.238	1.213	1.181	1.138	1.099	1.059	1.000	0.927	0.888	0.844	0.798	0.771	0.736	0.708	0.701	0.672
	41	1.222	1.196	1.165	1.122	1.084	1.044	0.987	0.918	0.880	0.840	0.797	0.772	0.739	0.714	0.707	0.681
	42	1.209	1.183	1.152	1.109	1.072	1.033	0.977	0.911	0.875	0.837	0.796	0.773	0.742	0.718	0.712	0.688
	43	1.202	1.176	1.145	1.103	1.067	1.029	0.974	0.911	0.876	0.840	0.801	0.779	0.750	0.727	0.721	0.699
	44	1.200	1.174	1.144	1.103	1.067	1.031	0.978	0.917	0.884	0.850	0.813	0.792	0.764	0.742	0.737	0.715
	45	1.200	1.174	1.145	1.106	1.071	1.036	0.985	0.926	0.894	0.862	0.826	0.807	0.780	0.759	0.754	0.733
	46	1.200	1.174	1.146	1.107	1.073	1.038	0.989	0.932	0.901	0.870	0.836	0.817	0.791	0.771	0.766	0.746
	47	1.202	1.177	1.149	1.111	1.078	1.044	0.996	0.942	0.912	0.882	0.850	0.831	0.807	0.788	0.783	0.765
	48	1.206	1.181	1.154	1.117	1.085	1.052	1.004	0.951	0.922	0.893	0.861	0.843	0.819	0.800	0.796	0.778
	49	1.213	1.189	1.162	1.126	1.095	1.063	1.017	0.966	0.938	0.910	0.880	0.863	0.840	0.822	0.819	0.802
	50	1.219	1.195	1.169	1.134	1.104	1.073	1.028	0.979	0.952	0.925	0.896	0.880	0.857	0.841	0.837	0.821

Table 6

# Area 2C – Reverse Slot Limit

- ▶ What happened in 2012?
  - ▶ U45O68 reverse slot limit, harvest 44,311.
  - ▶ Predicted average weight = 17.96 lb
  - ▶ Observed average weight = 14.55

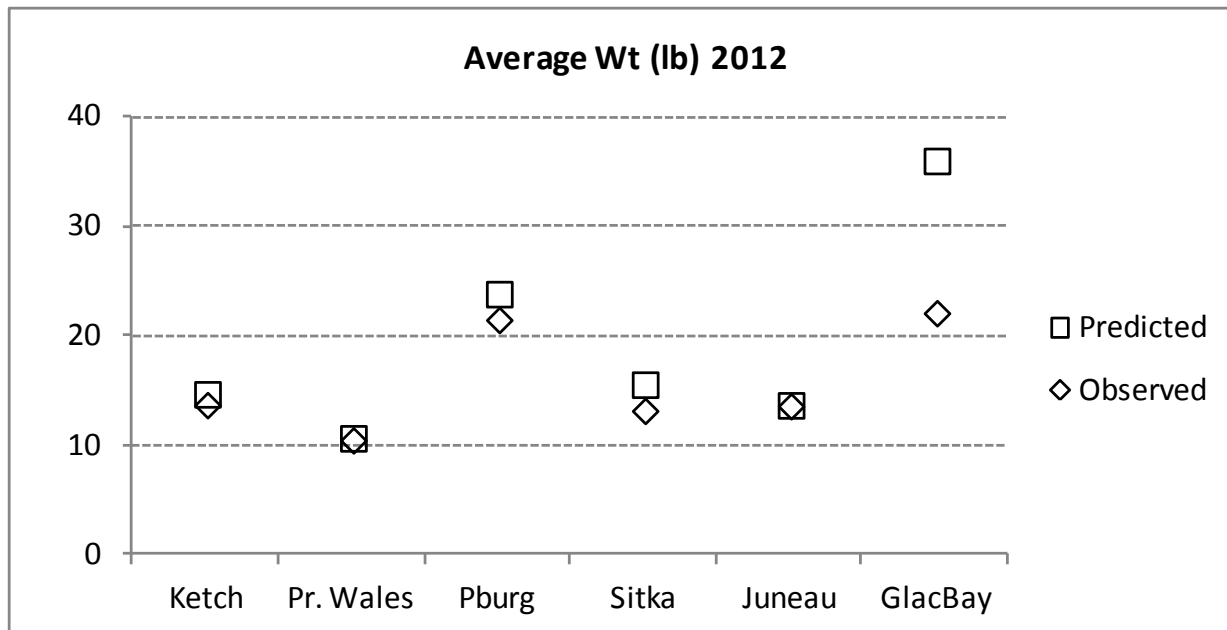


Figure 3

# Area 2C – Reverse Slot Limit

- ▶ What happened in 2012?
  - ▶ Predicted yield for U45O68 (44,3 I I) = 0.796 Mlb
  - ▶ “Observed” yield for U45O68 (44,3 I I) = 0.645 Mlb

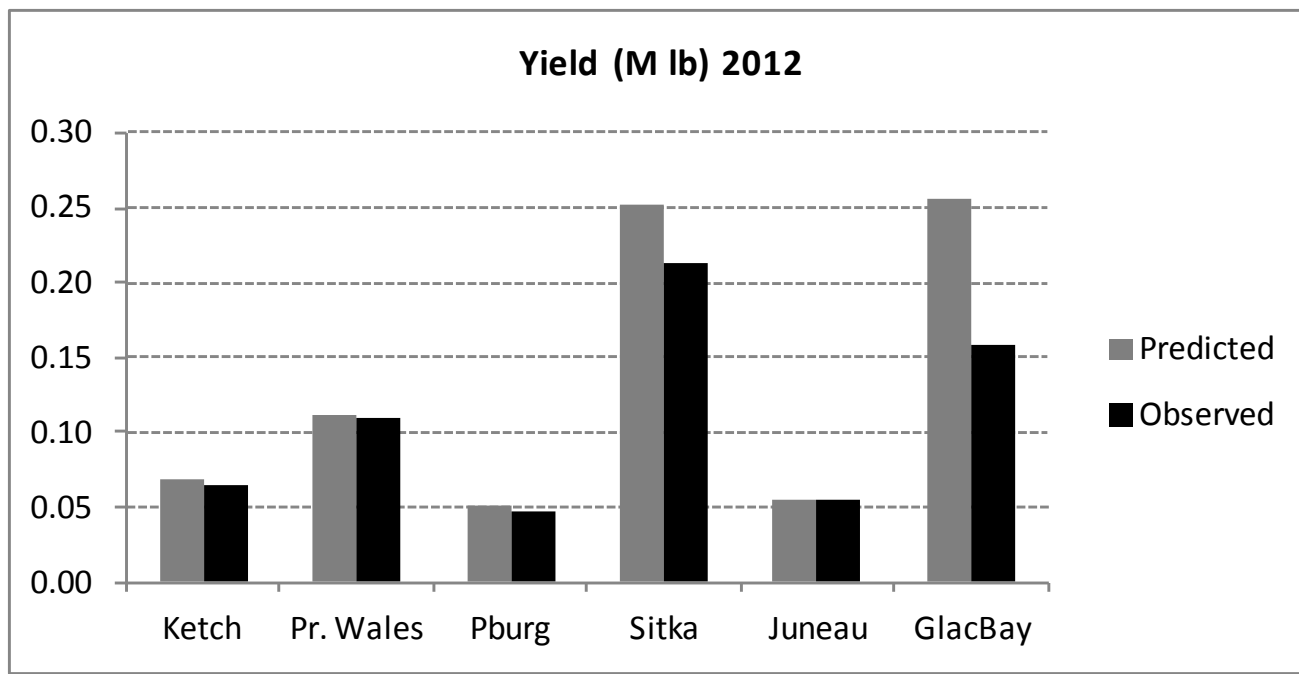


Figure 3

# Area 2C – Reverse Slot Limit

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- ▶ Alternate projection for U45O68 for 2013
  - ▶ What if mean weight by subarea same in 2013 as 2012?

Forecast Method	Harvest Forecast	Area 2C Average Weight ( lb) <sup>a</sup>	Yield (M lb)
Time Series	44,352	14.553	0.645
Recent Rate of Change	54,908	14.605	0.802
Annual Harvest Distribution	47,148	14.612	0.689

Table 10

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# Area 2C - Max Size Limit + Annual Limit

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- ▶ One fish daily bag limit
- ▶ Maximum size limit, plus annual limit of one fish larger than the size limit
- ▶ Single harvest projection = 47,148
  - ▶ Forecast no. anglers (2010-2012 average)
  - ▶ Apply annual harvest distribution

# Area 2C - Max Size Limit + Annual Limit

- ▶ No experience or data/information from regulation
- ▶ Assumptions:

Scenario	Number of halibut $> L_{\max}$	Average weight of halibut $> L_{\max}$	Average weight of halibut $\leq L_{\max}$
A	Every angler harvests one fish.	Equal to average weight of halibut $> L_{\max}$ in 2010.	Equal to predicted weight of a halibut of length $L_{\max}$
B			Equal to average weight of halibut $\leq L_{\max}$ in 2010.
C	Proportion of anglers that keep one equals the proportion of harvest in 2010 that was $> L_{\max}$		Equal to predicted weight of a halibut of length $L_{\max}$
D			Equal to average weight of halibut $\leq L_{\max}$ in 2010.



# Area 2C - Max Size Limit + Annual Limit

- ▶ Yield projections only used harvest forecast of 47,148.
- ▶ Yield varied substantially among the four scenarios.

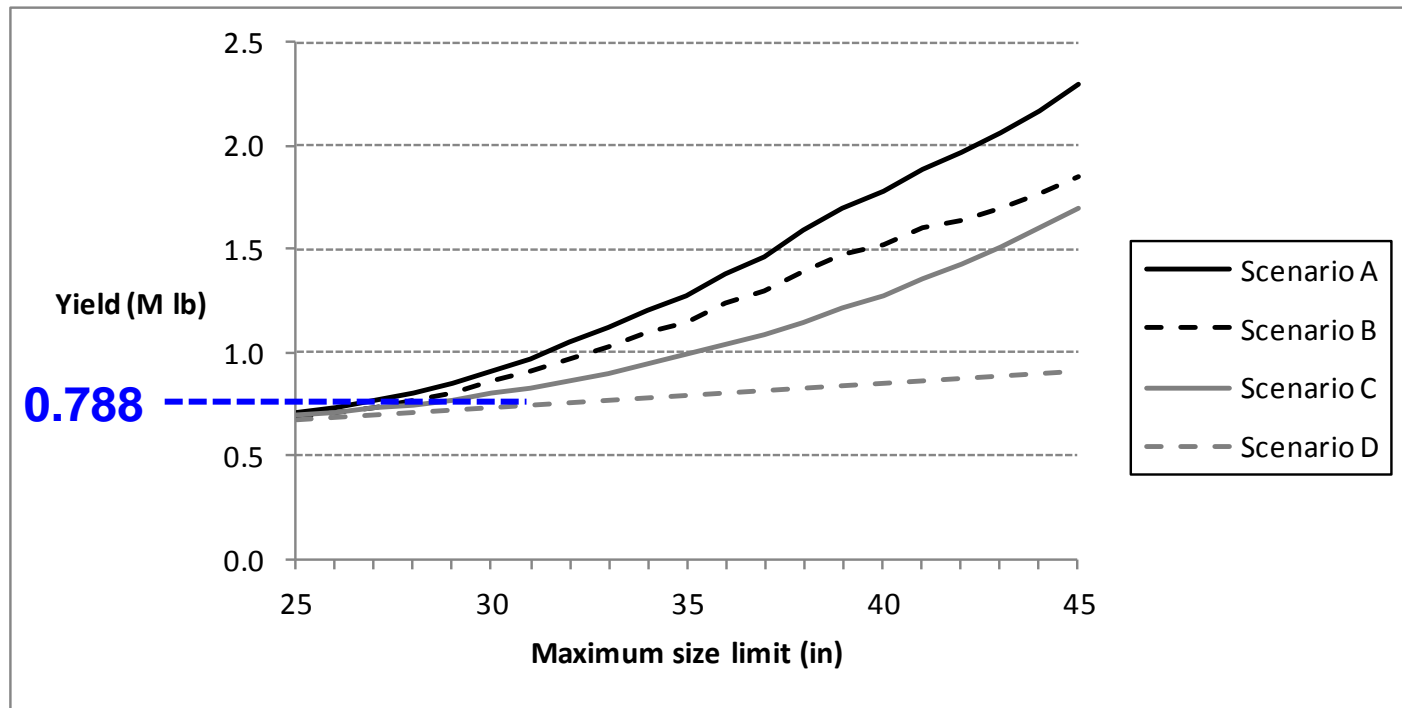


Figure 2

# Area 3A – Harvest Forecast

Method	Forecast (no. fish)	Std Err
Time Series	176,506	12,505

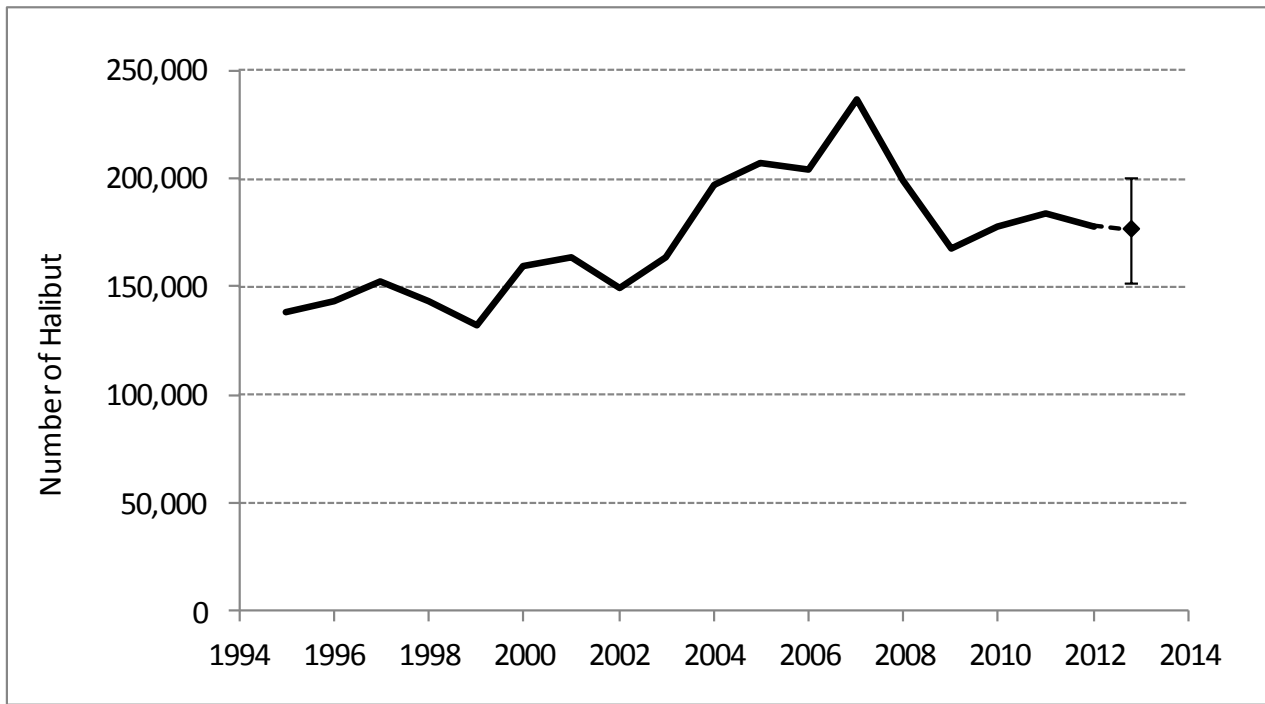
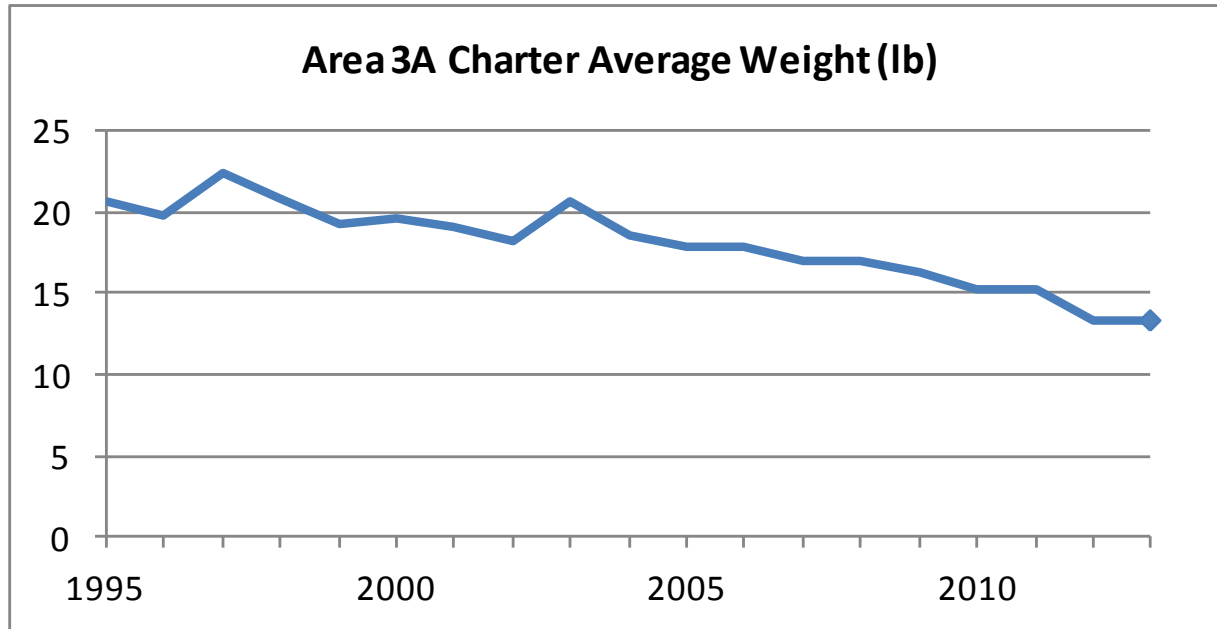


Figure 4

# Area 3A – Yield Forecast



Harvest Method	Average Wt. Method	Yield
Time Series	Same as 2012 by subarea	2.338

# Area 3A – Crew Harvest Prohibition

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Year	Regulations	Crew Harvest %
2006	No prohibition	10.419%
2007	State EO prohibited crew harvest 5/01-12/31	0.088%
2008	State EO prohibited crew harvest 5/24-9/01	0.545%
2009	State EO prohibited crew harvest 5/23-9/01	0.656%
2010	No prohibition	5.701%
2011	No prohibition	6.204%

# Area 3A – Crew Harvest Prohibition

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Subarea	Percent of Harvest by Crew		
	2010	2011	Average
Kodiak	5.57%	5.82%	5.69%
CCI	7.74%	8.18%	7.96%
LCI	5.03%	5.76%	5.40%
NGulf	5.39%	5.54%	5.47%
WPWS	2.88%	2.79%	2.83%
EPWS	3.84%	5.20%	4.52%
Yakutat	0.06%	1.43%	0.74%
G3A	2.04%	0.10%	1.07%
	5.70%	6.20%	5.95%

See Table 12

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# Area 3A – Crew Harvest Prohibition

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## ▶ Yield projections

Estimate	Yield (M lb)
Prelim yield estimate for 2012	2.375
Yield projection for 2013 (status quo regulations)	2.338
Yield projection for 2013 with crew harvest prohibition	2.208
GHL associated with IPHC “blue line” alternative	2.373

# Questions?

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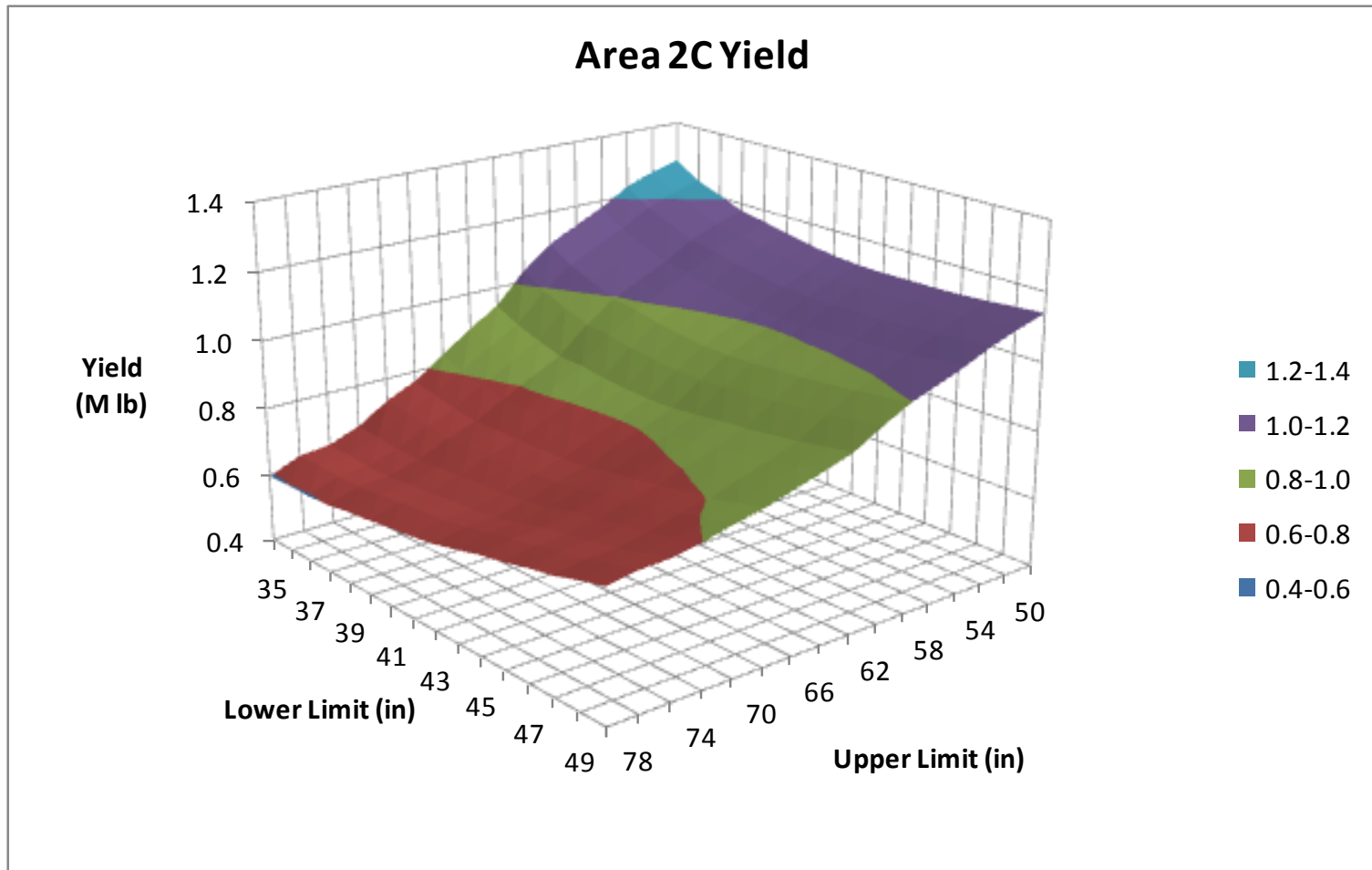
# Additional slides





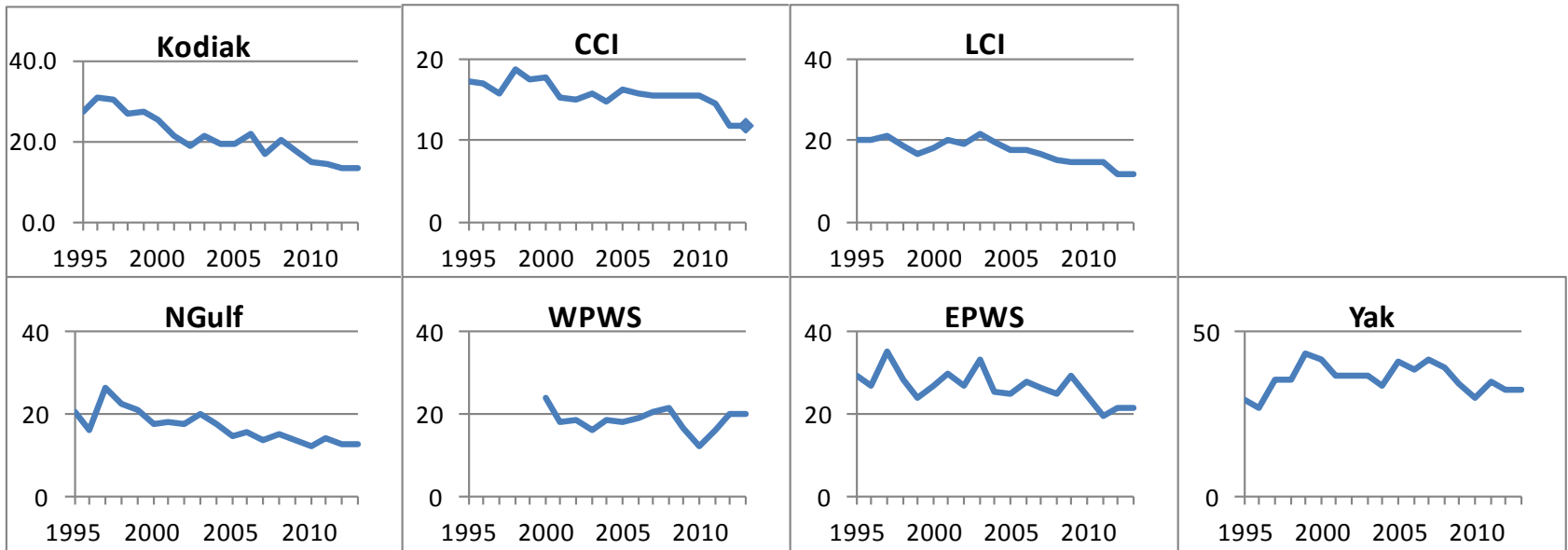
# Area 2C - Reverse Slot Limit

- ▶ Yield surface for harvest = 44,352.



# Area 3A – average weight by subarea

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# tCEY, GHL “triggers,” and 2013 ebio

Area 2C	ebio =	23.28		Area 3A	ebio =	70.38
tCEY	HarvRate	GHL		tCEY	HarvRate	GHL
4.779	20.5%	0.788		11.425	16.2%	2.008
<b>5.000</b>	<b>21.5%</b>	<b>0.788</b>		13.964	19.8%	2.373
5.841	25.1%	0.931		<b>15.130</b>	<b>21.5%</b>	<b>2.373</b>
6.903	29.7%	1.074		16.504	23.4%	2.734
7.965	34.2%	1.217		19.042	27.1%	3.103
9.027	38.8%	1.432		21.581	30.7%	3.650