Science, Service, Stewardship

Cost and Earnings in the Alaska Saltwater Sport Fishing Charter Sector *

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NOAA FISHERIES SERVICE

Pacific halibut fisheries off Alaska

Two main IPHC regulatory areas where both guided and unguided Pacific halibut sport fishing occur

Area 2C (Southeast Alaska)

Area 3A (Southcentral Alaska)
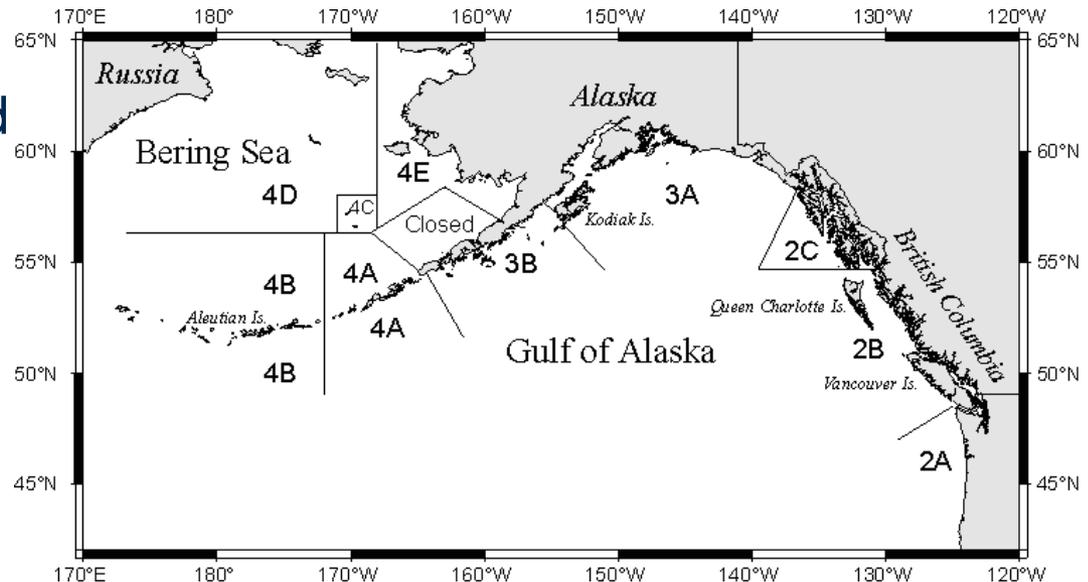
Important Issues
- Declining stocks over the last decade
- Until 2014, allocation was determined using a guideline harvest level policy
- Guided (charter) sector has grown substantially (until recent years)
- Halibut IFQ program excludes non-commercial and non-CDQ entities, thereby precluding the flow of IFQ across sectors
- **Catch Sharing Plan (CSP)** implemented in 2014
  - Sets formula for commercial/recreational allocation depending on stock
  - Allows leasing of IFQ from commercial sector to charter sector

Project goals

- Collect baseline economic data from charter businesses

- Generate population-level estimates (total revenues, total costs, employment, etc.)
  - Fishery/state-level (here)
  - Fishing community and regional level (in progress)

- Use sample weighting and data imputation approaches to adjust for missing data
  - Methodologies described in Lew, Himes-Cornell, and Lee (2015, *Marine Resource Economics*)

- Identify/assess trends in costs, revenues, employment in 2011-2013 fishing seasons
  - Details in NOAA tech memo (Lew, Sampson, Himes-Cornell, Lee, and Garber-Yonts 2015)

Alaska Saltwater Sport Fishing Charter Business Survey

- 12 page survey that collects data from Alaska charter businesses offering sport fishing trips to angler clients in Alaska

- Target population: All active charter businesses in Alaska

- Data collected include: employment, services offered, revenues, costs, types of clients

- Administered as a population census in 2012-2014 as a repeat mail survey (using a modified Dillman approach including a telephone prompt)

Fishing Year	Population Size	Unit Responses	Response Rate
2011	650	174	27%
2012	592	141	24%
2013	572	125	22%

Missing data

- Missing data comes in two forms
  - **Unit non-response**: sampled individuals or entities (i.e., the targeted respondents contacted to participate) that do not respond to any component of the survey
  - **Item non-response**: refers to cases where individual questions in the survey are left unanswered

- Voluntary social and economic surveys in fisheries contexts often have missing data

- Missing data may introduce biases in survey estimates if unaddressed

- Weighting and data imputation are used to adjust sample data for missing data

Sample weighting

Individual weight for individual i (w_i), $\forall\, i$ in n (Brick and Kalton):

$$w_i = w_{1i} \times w_{2i} \times w_{3i}$$

where

w_1 = sample selection weight ("base" weight)

inverse of the probability of being selected for sample (e.g., N/N^{pop} for simple random sample)

w_2 = non-response adjustment weight

adjusts for difference in those who respond and those who do not

w_3 = post-stratification weight

ensures that the sample conforms to a known population characteristic (reduces coverage error)

Non-response adjustment and post-stratification weights

- Non-response weight (w_2)
  - Used logit model to identify differences between respondents and non-respondents based on 17 variables from charter logbook records
  - Weighting classes: divide respondents and non-respondents on small number of characteristics (respondents given weights equal to inverse of frequency within each cell)

- Post-stratification weights (w_3)
  - Weights were based on both effort (as measured by total client trips) and IPHC area

2011

Variable	2011 weight (w_2)	Percent of responding sample (%)
No late shoulder or off-season fishing	1.3248	15.52
No late shoulder fishing but some off-season fishing	2.2996	0.57
Some late shoulder fishing but no off-season fishing	0.9808	74.71
Both late shoulder and off-season fishing	0.527	9.2

2012

Variable	2012 weight (w_2)	Percent of responding sample (%)
Did not fish for salmon	0.6562	14.08
Fished for salmon	1.0588	85.92

2013

Variable	2013 weight (w_2)	Percent of responding sample (%)
No late season fishing	1.8837	10.32
Late season fishing	0.8983	89.68

Data imputation: K-nearest neighbor imputation

- Distance function is used to determine the most similar item respondent to each item non-respondent.
  - Charter logbook data provided the auxiliary information
  - Eight variables related to where, how much, and when fishing was done, as well as the types of fishing, such as target species

- Missing values are randomly selected from among the K=3 nearest neighbors

Population totals and variances

- Totals for costs, revenues, and employment are calculated by weighted summation over constituent categories after the missing data have been imputed

- Variances are calculated using the simulation approach of Shao (2002) that accounts for the variance associated with the data imputation method

Labor population estimates, 2011-2013

Guides

Crew

Shore workers

Notes:
- Population of charter businesses fell between 2011-2013 (650 to 572)
- Full and part-time workers aggregated
- Most year-to-year changes occurred in main fishing season (Memorial Day to Labor Day)

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Estimated mean costs by type
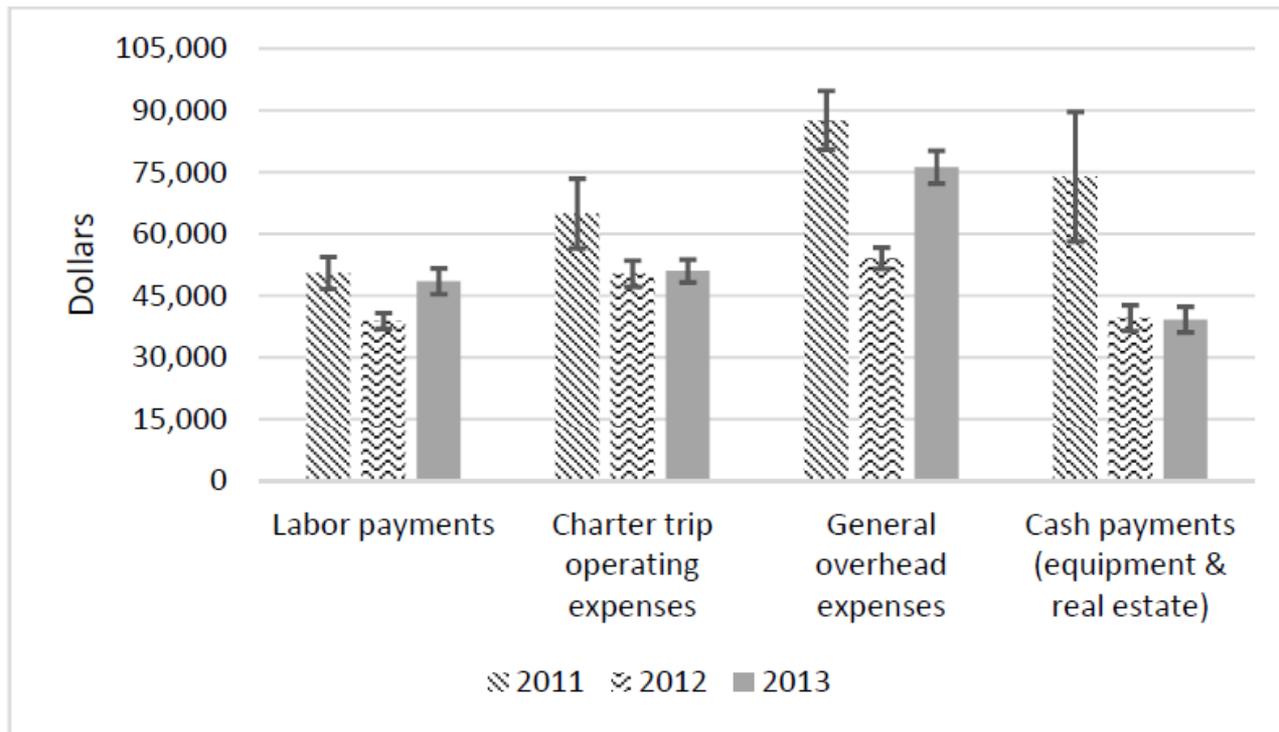
Figure 34. -- Mean estimated major expenses by type for the population of charter businesses for 2011-2013. Error bars represent two standard errors above and below the means.

Mean total revenues and costs
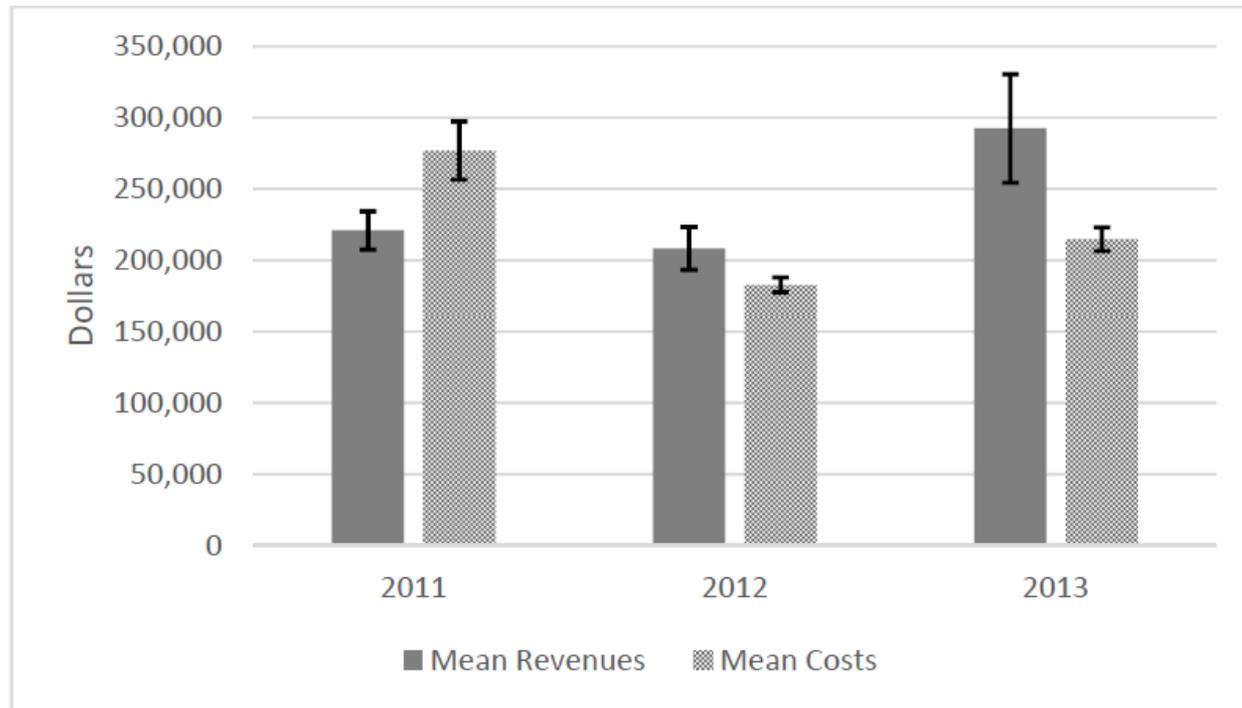
Figure 33. -- Mean estimated population-level revenues for the 2011, 2012, and 2013 fishing years. Error bars represent two standard errors around the mean.

Population-level total revenue and cost estimates

Table 38. -- Summary of total (in millions) and mean revenues and expenses for the 2011, 2012, and 2013 fishing years (in 2013 dollars).

	2011		2012		2013	
	Total	Mean	Total	Mean	Total	Mean
Revenues	144.90	220,931	124.91	208,321	171.72	292,535
	(4.39)	(6,719)	(4.50)	(7,567)	(10.99)	(19,034)
Total Costs (excluding investment payments)	181.65	276,956	109.61	182,807	126.14	214,883
	(7.14)	(10,164)	(1.70)	(2,623)	(2.35)	(4,130)
Labor Expenses	33.11	50,489	23.30	38,863	28.47	48,499
	(1.28)	(1,941)	(0.58)	(976)	(0.91)	(1,573)
Charter Trip Expenses	42.60	64,952	30.16	50,305	29.93	50,990
	(2.77)	(4,233)	(0.96)	(1,601)	(0.81)	(1,391)
Overhead Expenses	57.47	87,618	32.44	54,110	44.75	76,231
	(2.34)	(3,554)	(0.77)	(1,284)	(1.14)	(1,984)
Capital Expenditures	48.47	73,897	23.70	39,528	22.99	39,162
	(5.18)	(7,874)	(0.93)	(1,550)	(0.91)	(1,556)
Investment Payments	23.64	36,051	30.73	51,249	27.91	47,546
	(1.85)	(2,823)	(1.87)	(3,107)	(2.08)	(3,540)

Note: standard errors are given in parentheses.

Discussion

- Labor
  - Some shifts to more full-time employment for shore and crew workers, decline in number of shore workers
  - Total number of guides were fairly constant across years despite a shrinking fleet
- Revenues and Costs
  - Revenues were higher in 2013 compared to 2011
  - Except for investment expenses, average per business costs were lower in 2013 than in 2011
- Implications
  - Charter sector operated at a loss during 2011, but then became profitable in 2012-2013

Next Steps

- Fishing community-level analysis (in progress)
  - Apply weighting and data imputation to generate fishing community-level estimates
  - Did recreational charter fishing change in the years leading up the CSP in fishing communities?

- Contributions analysis (state and regional levels)
  - Generate estimates of total output, spending, and employment

- Post-CSP survey
  - Will be conducted in 2016 and 2017

- Individual firm-level modeling: profit functions and entry-exit decisions to measure effects of allocation and/or regulations