

**Estimation of the Trip Variable Costs with 1997-2017 Observer Data  
for the New England Region Scallop Fishery**

Data for variable costs includes trip expenses such as food, fuel, ice, water, oil and supplies (FFIWOS) costs for the scallop fishing operation. Trip costs for limited access (LA) and limited access general category (LAGC) vessels are obtained from the observer cost data for 1997-2017 fish years. Trip costs per day-at-sea may differ from the average estimated values depending on the vessel size and other variables. Further they differ by fleet types (or permit categories) within the scallop fishery.

Trip cost per day-at-sea (*FFIWOS<sub>pda</sub>*) was estimated using a regression method as a function of vessel length (LEN), vessel horse power (HP), vessel crew size (CREW), fuel price (FUELPR), and dummy variables (= 1) for limited access general category (LGC—IFQ) and small dredge (SMD) vessels. Both the trip cost and fuel price are measured in 2017 dollar. Since the observer data didn't have adequate sample representing the NGOM vessels for a separate estimation, trip cost parameter estimates for the IFQ was instead used as a proxy for NGOM vessels. The trip cost equation in double-logarithmic form was estimated using a regression method is given as:

$$\ln(FFIWOS_{pda}) = \beta_0 + \beta_1 \cdot \ln(LEN) + \beta_2 \cdot \ln(HP) + \beta_3 \cdot \ln(CREW) + \beta_4 \cdot \ln(FUELPR) + \delta_1 \cdot IFQ + \delta_2 \cdot SMD$$

The empirical equation presented in Table 1 explains about 79% of the variation in trip costs and has proper statistical properties. The model used 2,195 observations that included both the LA and LAGC vessels during 1997-2017. Only observations with complete information were included for the analysis. The data used in the analysis represented about one third of observed trips (N=6673 and n=2195) that involved 523 unique vessels that held LA and LAGC (IFQ) permits (Table 1.1 and 1.2). Trip cost was estimated by permit categories for the years 2010-2017, as the IFQ program was fully implemented since 2010.

Tables 2.1 to 2.3 provides annual estimation of the trip costs for the LA and LAGC (IFQ) and LAGC (NGOM) vessels. The estimated average trip costs for LA, LAGC(IFQ) and LAGC(NGOM) vessels were \$1757, \$616 and \$421, respectively. The estimated trip costs in 2017 are near around the cost in 2010. The costs increased during mid-2010s but have fallen in recent years. Fuel price has been an important factor on the level of the trip costs, as the variable bears a major weight on the trip cost

allocations. The trends on trip costs and their factors are also presented in Tables 2.1 to 2.3. Table 3 presents the ratio of trip costs in 2017 for a category relative to another category permit type or fleet.

**Table 1. Estimation of total trip costs per DAS for the limited access & limited access general category vessels**

<b>Nonlinear GMM Summary of Residual Errors</b>								
<b>Equation</b>	<b>DF Model</b>	<b>DF Error</b>	<b>SSE</b>	<b>MSE</b>	<b>Root MSE</b>	<b>R-Square</b>	<b>Adj R-Sq.</b>	<b>Durbin Watson</b>
<i>ln(FFIWOSpda)</i>	7	2195	152.3	0.0694	0.2634	0.7857	0.7851	1.5093
<b>Nonlinear GMM Parameter Estimates</b>								
<b>Variables (in natural log)</b>	<b>Estimate</b>		<b>Approx. Std. Err.</b>		<b>t-Value</b>	<b>Approx. Pr. &gt;  t </b>		
<b>INTC (intercept)</b>	$\beta_0$	2.048788	0.1938		10.57	<.0001		
<b>LEN (length)</b>	$\beta_1$	0.793195	0.0550		14.41	<.0001		
<b>HP (horse power)</b>	$\beta_2$	0.107115	0.0247		4.35	<.0001		
<b>CREW (crew #)</b>	$\beta_3$	0.303055	0.0350		8.65	<.0001		
<b>FUELP (fuel price in 2017\$)</b>	$\beta_4$	0.743611	0.0197		37.82	<.0001		
<b>LGC--IFQ</b>	$\delta_1$	-0.35419	0.0348		-10.17	<.0001		
<b>SMD</b>	$\delta_2$	-0.17269	0.0233		-7.40	<.0001		

**Table 1.1. Distinct count of VP\_NUM (vessels) used in trip cost regression analysis (2001-2017)**

<b>Permit Type</b>	<b>Total</b>
IFQ	133
LA	374
LA with IFQ	45
<b>Grand Total</b>	<b>523</b>

**Table 1.2. Distinct count of VP\_NUM (vessels) used in trip cost regression analysis by fishyear**

<b>Fish Year</b>	<b>LA only</b>	<b>LA with IFQ</b>	<b>IFQ only</b>	<b>Total</b>
2001	20			20
2002	27			27
2003	32			32
2004	69			69
2005	53			53
2006	52			52
2007	103	1		104
2008	111	17	34	162
2009	85	18	27	130
2010	83	13	14	110
2011	79	7	12	98
2012	96	12	9	117
2013	90	11	34	135
2014	88	17	41	146
2015	98	21	47	166
2016	114	15	47	176
2017	115	18	51	184
<b>Distinct VP_Num (2001-2017)</b>				<b>523</b>

Table 2.1 Trip cost estimates for LA only vessels





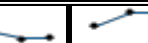
Year	LEN	HP	Crew	Fuelp (2017\$)	Trip Cost per DA (in 2017\$)
2010	83.37	863.92	7.66	2.91	\$2,195
2011	83.23	865.25	7.64	3.89	\$2,713
2012	83.04	869.90	7.63	3.92	\$2,726
2013	82.68	867.42	7.63	3.79	\$2,647
2014	82.75	867.25	7.64	3.60	\$2,550
2015	82.82	868.56	7.29	2.55	\$1,951
2016	82.77	872.89	7.21	2.14	\$1,704
2017	82.87	868.76	7.19	2.23	\$1,757
Micro Charts					

Table 2.2. Trip cost estimates for LAGC-- IFQ only vessels






Year	Len	HP	Crew	Fuelp (2017\$)	Trip Cost per DA (in 2017\$)
2010	53.96	420.65	3.78	2.88	\$680
2011	54.25	426.79	3.89	4.00	\$880
2012	54.92	433.99	4.19	4.09	\$927
2013	55.09	431.68	4.20	3.79	\$877
2014	55.65	440.43	4.30	3.56	\$853
2015	55.61	441.75	4.37	2.60	\$677
2016	55.36	443.74	4.49	2.24	\$609
2017	55.10	438.24	4.48	2.29	\$616
Micro Charts					

Table 2.3 Trip cost estimates for LAGC-- NGOM only vessels






Year	LEN	HP	Crew	Fuelp (2017\$)	Trip Cost per DA (in 2017\$)
2010	43.06207	299.4643	1.448276	2.88	\$410
2011	46.73333	385.4667	1.933333	4.00	\$626
2012	52.03846	442.7692	1.576923	4.09	\$662
2013	46.03032	345.0736	1.741176	3.79	\$569
2014	44.34832	361.3435	1.981538	3.56	\$551
2015	46.78683	361.5677	2.205882	2.60	\$470
2016	42.40028	411.452	2.565826	2.24	\$413
2017	43.47158	412.1573	2.431579	2.29	\$421
Micro Charts					

Table 3. Trip costs per DAS Ratios in 2017

<b>Permit categories</b>	<b>Ratio</b>	<b>Percent</b>
IFQ/LA	0.35	35%
NGOM/IFQ	0.68	68%
NGOM/LA	0.24	24%

NP file: v4\_Variable or Trip Costs updates for LA LGC vessels 2017\_08232018.docx