

Appendix I

Analytic Techniques

DAS Leasing Simulation

Introduction

Amendment 13 analysis of DAS leasing used a simulation model to estimate impacts of a leasing program on DAS use. The model generated the highest overall fleet revenue via DAS leasing. By definition, all vessels will either fish or lease their DAS in this model – the only vessels who do not are whose predicted revenue falls short of variable costs and cannot find a more profitable lessee for their DAS. The model used several assumptions that may not reflect the actual DAS leasing market. The model assumes no transaction costs, perfect information and communication, and instantaneous lease trades, each taking place under the most profitable terms. The salient point is that in the model vessels expected to clear any profit at all by either fishing or leasing will do so. Historical trends in DAS use indicate that this may not be the case – most permit holders do not use all their DAS.

An additional simulation model was developed to expand on the information included in Amendment 13. The primary change is that in this model all leases do not occur simultaneously and each individual leasing decision is made based on the best available lease terms. Since the order of leases may affect those decisions, the leasing order is random and changes for each of a series of iterations of the model. An additional change is that buyer and sellers are identified based on DAS use. The results are summarized to provide a distribution of the likely results.

Data

An Excel database was constructed that includes the FY 2004 DAS allocations, FY 2001 DAS use, and permit characteristics for each limited access multispecies permit. Permits are listed by moratorium right number so that they are consistent with permit history over time. The data include vessels in the permit history category, as well as some vessels for which certain characteristics (length, homeports state, etc.) could not be determined. Since the data were obtained early in the fishing year, they may not reflect final DAS allocations due to appeals, late renewals or permits, changes in permit ownership, etc. Nevertheless, the data are believed to be representative of the final DAS allocations. The data are replicate in two worksheets, one for “buyers” and one for “sellers.” Both worksheets include all permits. The permits on the “seller” worksheet are sorted by value of a DAS.

A value is assigned to each permit that is equivalent to the average revenue earned per DAS. For permits that did not have a value, the median was used.

Methods

The simulation model was developed using Excel Visual Basic. The model identifies each permit as either a “buyer” or “seller” of DAS. Buyers are those who are allocated less DAS in FY 2004 than were used in FY 2001, while sellers are those who are allocated more DAS in FY 2004 than used in FY 2001. A buyer is selected and that buyer is matched with sellers in an attempt to meet the buyer’s need for additional DAS. A suitable match only occurs if the length and horsepower of the seller fall within the vessel

upgrading restrictions, and the price of the buyer is satisfactory to the seller. In order to reflect the likelihood that some negotiation will occur between buyers and sellers, the price is considered suitable if the buyer is willing to pay 90 percent or more of the seller's asking price. When a tax is applied, the tax is assumed to reduce the price the buyer is willing to pay and also reduces the number of DAS obtained in the transaction. Consistent with current regulations, sellers cannot lease out fractional DAS, but because of a tax, a buyer can obtain fractional DAS.

Once a buyer is selected, the program has that buyer continue to search for sellers until either the buyer's total DAS need is met or the buyer searches through all possible sellers. The program can be run to limit buyers to either the DAS used in FY 2001 (FY 2004 allocation plus leased DAS), or to the maximum that can be leased under Amendment 13 (2004 allocation plus 2001 allocation). Since the sellers are sorted by value of a DAS, and the buyer steps through the available permits until a suitable seller is found, the buyer always finds the lowest priced DAS.

In order to estimate the number of DAS that will be used, once lease transactions occur a use rate is applied to the DAS available. For any permit that did not obtain DAS in a lease, DAS were assumed to be used at a rate of 85 percent, consistent with the mid-point estimate in Amendment 13. For any permit that obtained DAS in a lease, all DAS for that permit were assumed to be used at a higher rate. That higher rate was set at 97 percent for the initial run, and then was set at 90 percent in a second run in order to provide an indication of the sensitivity of the results to the assumed use rate for leased DAS.

After all buyers are processed, the results are summarized. Allocations are summarized by homeport state and by length group, the total number of DAS changing hands is provided, and an estimate of likely DAS use is developed. The order of buyers is randomized and the process begins again. The initial run used 300 iterations. Because the results show little variation, subsequent runs used only 100 iterations.

Assumptions

The model results are subject to a number of assumptions that may or may not be accurate. Key assumptions include:

- (1) The difference between FY 2004 DAS allocations and FY 2001 DAS use is used in two key ways: to identify buyers and sellers (in most model runs) and to determine the maximum number of DAS leased. Other factors that bear on the decision to buy or sell DAS (such as the availability of capital) are not incorporated into the model
- (2) The model assumes perfect information for buyers – that is, buyers find the cheapest DAS available to lease in every transaction. Buyers in the model will obtain DAS from any permit that is identified as a seller as long as the characteristics (length, horsepower, and price) are a match.
- (3) Estimates of DAS use are not based on any experience under Amendment 13 regulations and may over or under-estimate actual use.

- (4) The perceived value of a DAS may have changed as a result of Amendment 13 regulations.
- (5) Each potential buyer attempts to fill its need for DAS before another buyer enters the market. In reality, transactions will occur at the same time.

Results

Results of the model are summarized below for four different model runs.

(1) The criteria for this run are:

- (a) Buyers and sellers were identified based on FY 2004 DAS allocations and FY 2001 DAS use.
- (b) Buyers were limited to obtaining enough DAS so that the total available DAS (FY 2004 allocation and DAS leased) is equal to the FY 2001 DAS used.
- (c) All DAS on permits that leased any DAS were assumed used at a rate of 97 percent.
- (d) The model was iterated 300 times.

Results are summarized using the mean results of the iterations in Table 1 and Table 2. The first row in each table shows the DAS available without a leasing or transfer program, and the other rows show the DAS available with a different conservation tax imposed. A tax of about thirty percent is necessary for the estimated DAS use to be similar to that estimated without a leasing program. For all taxes, DAS appear to move from vessels with a homeport state of Rhode Island, New York, New Jersey, Connecticut, or North Carolina to vessels claiming Massachusetts, Maine, or New Hampshire. Maine and New Hampshire have more DAS available for any tax rate, while vessels claiming Massachusetts as the homeport state have more DAS available for any tax of twenty percent or less, have nearly an identical amount at a tax of thirty percent, and have fewer DAS available at a forty percent tax. There are fewer DAS available in the two largest length classes for any tax, The smallest length class gains DAS for a tax of ten percent or less, but has fewer DAS available for the higher taxes. As shown by Table 3, the number of DAS available and estimated DAS used showed little variability in all 300 iterations.

Tax	MA	ME	RI	NH	NY	NJ	CT	NC	DAS Available	Estimated DAS Used	DAS Leased
N/A	24,923	6,285	3,529	2,573	2,407	1,352	511	432	43,332	36,832	0
0	25,865	6,572	3,305	2,822	1,944	1,064	452	419	43,332	38,291	4,774
0.1	25,590	6,497	3,268	2,771	1,933	1,056	450	414	42,854	37,749	4,771
0.2	25,239	6,473	3,265	2,812	1,905	1,015	427	408	42,396	37,281	4,678
0.3	24,941	6,404	3,233	2,750	1,934	1,006	427	407	41,942	36,743	4,631
0.4	24,717	6,301	3,180	2,703	1,917	1,008	424	406	41,491	36,208	4,600

Table 1 – Run 1 mean results summarized for eight homeport states.

Tax	DAS Available		
	"0 to < 50"	"50 to < 75"	"75 and over"
N/A	18,023	14,801	10,507
0	18,588	14,402	10,342
0.1	18,353	14,238	10,263
0.2	17,992	14,187	10,217
0.3	17,786	14,012	10,145
0.4	17,582	13,889	10,020

Table 2 – Run 1 mean results summarized by vessel length (feet)

<i>DAS Available</i>	<i>0</i>	<i>0.1</i>	<i>0.2</i>	<i>0.3</i>	<i>0.4</i>
40,750	0	0	0	0	0
41,000	0	0	0	0	0
41,250	0	0	0	0	0
41,500	0	0	0	0	230
41,750	0	0	0	0	70
42,000	0	0	0	300	0
42,250	0	0	0	0	0
42,500	0	0	300	0	0
42,750	0	0	0	0	0
43,000	0	300	0	0	0
43,250	0	0	0	0	0
43,500	300	0	0	0	0
More	0	0	0	0	0
<i>DAS Used</i>					
35,750	0	0	0	0	0
36,000	0	0	0	0	0
36,250	0	0	0	0	289
36,500	0	0	0	0	11
36,750	0	0	0	188	0
37,000	0	0	0	112	0
37,250	0	0	35	0	0
37,500	0	0	265	0	0
37,750	0	147	0	0	0
38,000	0	153	0	0	0
38,250	37	0	0	0	0
38,500	263	0	0	0	0
More	0	0	0	0	0

Table 3 – Run 1 results. Distribution of DAS available and estimated DAS used.

(2) The purpose of this model run was to determine how sensitive the estimate of DAS used is to the assumption that a permit that leases any DAS will use all 97 percent of all DAS attached to that permit. The criteria for this run were:

- (a) Buyers and sellers were identified based on FY 2004 DAS allocations and FY 2001 DAS use.
- (b) Buyers were limited to obtaining enough DAS so that the total available DAS (FY 2004 allocation and DAS leased) is equal to the FY 2001 DAS used.
- (c) All DAS on permits that leased any DAS were assumed used at a rate of 90 percent.
- (d) The model was iterated 100 times.

Results are summarized using the mean results of the iterations in Table 4 and Table 5. The first row in each table shows the DAS available without a leasing or transfer program, and the other rows show the DAS available with a different conservation tax imposed. As would be expected, there is little difference in the distribution of available DAS from the results in Run 1, whether summarized by homeport state or by vessel length. Because this run assumes that all DAS on a vessel that leases DAS are used at a rate of ninety percent, the number of used DAS is lower than in Run 1 for all tax rates. In this run, a conservation tax of between ten and twenty percent is necessary to keep DAS use at approximately the same level as without leasing, whereas the previous model run suggests a tax of between twenty and thirty percent is necessary. As shown by Table 6, the number of DAS available and estimated DAS used showed little variability in all 300 iterations.

Tax	MA	ME	RI	NH	NY	NJ	CT	NC	DAS Available	Estimated DAS Used	DAS Leased
N/A	24,923	6,285	3,529	2,573	2,407	1,352	511	432	43,332	36,832	0
0	25,857	6,591	3,306	2,808	1,954	1,058	452	415	43,332	37,440	4,774
0.1	25,581	6,509	3,268	2,768	1,931	1,055	449	414	42,854	36,977	4,771
0.2	25,215	6,497	3,259	2,828	1,906	1,012	423	405	42,395	36,554	4,682
0.3	24,936	6,406	3,237	2,747	1,932	1,009	425	406	41,943	36,106	4,629
0.4	24,719	6,303	3,167	2,707	1,919	1,010	425	405	41,491	35,659	4,602

Table 4 – Run 2 mean results summarized for eight homeport states with total DAS available, used, and leased

Tax	DAS Available		
	"0 to < 50"	"50 to < 75"	"75 and over"
N/A	18,023	14,801	10,507
0	18,576	14,392	10,363
0.1	18,348	14,249	10,257
0.2	18,002	14,185	10,208
0.3	17,781	14,020	10,142
0.4	17,568	13,883	10,040

Table 5 – Run 2 mean results summarized by vessel length (feet)

<i>DAS Available</i>	<i>0</i>	<i>0.1</i>	<i>0.2</i>	<i>0.3</i>	<i>0.4</i>
40,750	0	0	0	0	0
41,000	0	0	0	0	0
41,250	0	0	0	0	0
41,500	0	0	0	0	72
41,750	0	0	0	0	28
42,000	0	0	0	100	0
42,250	0	0	0	0	0
42,500	0	0	100	0	0
42,750	0	0	0	0	0
43,000	0	100	0	0	0
43,250	0	0	0	0	0
43,500	100	0	0	0	0
More	0	0	0	0	0
<i>DAS Used</i>					
35,750	0	0	0	0	100
36,000	0	0	0	0	0
36,250	0	0	0	100	0
36,500	0	0	0	0	0
36,750	0	0	100	0	0
37,000	0	99	0	0	0
37,250	0	1	0	0	0
37,500	100	0	0	0	0
37,750	0	0	0	0	0
38,000	0	0	0	0	0
38,250	0	0	0	0	0
38,500	0	0	0	0	0
More	0	0	0	0	0

Table 6 – Run 2 results. Distribution of DAS available and estimated DAS used.

(3) The purpose of this model run was to determine how DAS available and used would change if each permit acquiring DAS attempts to acquire the maximum number of DAS that can be leased under Amendment 13. The criteria for this run were:

- (a) Buyers and sellers were identified based on FY 2004 DAS allocations and FY 2001 DAS use.
- (b) Buyers were limited to obtaining the maximum number of DAS allowed by Amendment 13.
- (c) All DAS on permits that leased any DAS were assumed used at a rate of 97 percent.
- (d) Because of the small amount of variability in the results for Run 1, this run was iterated only 100 times.

Results are summarized using the mean results of the iterations in **Table 7** and **Table 8**. The first row in each table shows the DAS available without a leasing or transfer program, and the other rows show the DAS available with a different conservation tax imposed. A tax of about twenty percent is necessary for the estimated DAS use to be similar to that estimated without a leasing program. For all taxes, DAS appear to move from vessels with a homeport state of Rhode Island, New York, New Jersey, Connecticut, or North Carolina to vessels claiming Massachusetts, Maine, or New Hampshire. New Hampshire has more DAS available for any tax rate, while vessels claiming Maine as the homeport state have more DAS available for a tax of thirty percent or less, while Massachusetts vessels have more DAS available for any tax of twenty percent or less. There are fewer DAS available in the two largest length classes for any tax. The smallest length class gains DAS for a tax of twenty percent or less, but has fewer DAS available for the higher taxes. As shown by **Table 9**, the number of DAS available and estimated DAS used showed little variability in all 100 iterations.

<i>Tax</i>	<i>MA</i>	<i>ME</i>	<i>RI</i>	<i>NH</i>	<i>NY</i>	<i>NJ</i>	<i>CT</i>	<i>NC</i>	<i>DAS Available</i>	<i>Estimated DAS Used</i>	<i>DAS Leased</i>
N/A	24,923	6,285	3,529	2,573	2,407	1,352	511	432	43,332	36,832	0
0	25,831	6,544	3,279	2,770	2,014	1,099	486	421	43,332	37,707	4,774
0.1	25,558	6,412	3,291	2,722	2,024	1,086	470	414	42,854	37,225	4,774
0.2	25,273	6,404	3,256	2,810	1,941	1,015	443	401	42,380	36,795	4,759
0.3	24,914	6,361	3,231	2,759	1,952	1,018	432	401	41,913	36,303	4,728
0.4	24,698	6,238	3,185	2,726	1,927	998	440	401	41,441	35,821	4,726

Table 7 – Run 3 mean results summarized for eight homeport states.

<i>Tax</i>	<i>DAS Available</i>		
	<i>"0 to < 50"</i>	<i>"50 to < 75"</i>	<i>"75 and over"</i>
N/A	18,023	14,801	10,507
0	18,840	14,325	10,167
0.1	18,577	14,168	10,108
0.2	18,209	14,123	10,048
0.3	17,971	13,982	9,960
0.4	17,738	13,829	9,874

Table 8 – Run 3 mean results summarized by vessel length (feet)

<i>DAS Available</i>	<i>Tax</i>				
	<i>0</i>	<i>0.1</i>	<i>0.2</i>	<i>0.3</i>	<i>0.4</i>
40,750	0	0	0	0	0
41,000	0	0	0	0	0
41,250	0	0	0	0	0
41,500	0	0	0	0	100
41,750	0	0	0	0	0
42,000	0	0	0	100	0
42,250	0	0	0	0	0
42,500	0	0	100	0	0
42,750	0	0	0	0	0
43,000	0	100	0	0	0
43,250	0	0	0	0	0
43,500	100	0	0	0	0
More	0	0	0	0	0
<i>Estimated DAS Used</i>					
35,750	0	0	0	0	0
36,000	0	0	0	0	100
36,250	0	0	0	0	0
36,500	0	0	0	100	0
36,750	0	0	1	0	0
37,000	0	0	99	0	0
37,250	0	87	0	0	0
37,500	0	13	0	0	0
37,750	98	0	0	0	0
38,000	2	0	0	0	0
38,250	0	0	0	0	0
38,500	0	0	0	0	0
More	0	0	0	0	0

Table 9 – Run 3 results. Distribution of DAS available and estimated DAS used.

(4) The purpose of this model run was to examine whether including GRT as one of the vessel characteristics that must fall within the vessel replacement restrictions would reduce the number of DAS leased. Model parameters were the same as for Run 1, with the exception that the GRT of buying and selling vessels was also compared. The criteria for this run are:

- (a) Buyers and sellers were identified based on FY 2004 DAS allocations and FY 2001 DAS use.
- (b) Buyers were limited to obtaining enough DAS so that the total available DAS (FY 2004 allocation and DAS leased) is equal to the FY 2001 DAS used.
- (c) All DAS on permits that leased any DAS were assumed used at a rate of 97 percent.

- (d) In order for a lease to occur, the GRT of the buying vessel must be within 10 percent of the selling vessel.
- (e) The model was iterated 300 times.

Results are summarized using the mean results of the iterations in **Table 10** and Table 11. The first row in each table shows the DAS available without a leasing or transfer program, and the other rows show the DAS available with a different conservation tax imposed. A tax of about thirty percent is necessary for the estimated DAS use to be similar to that estimated without a leasing program. The results are very similar to those for Run 1 with respect to movement between states, though it appears that vessel homeported in Massachusetts do not acquire as many DAS in this run. With respect to vessel size classes, including GRT results in fewer DAS available to vessels over fifty feet in length than the results for Run 1. Overall, slightly fewer DAS are likely to be leased than was apparent in Run 1. Perhaps the most noticeable difference is that including GRT as a criteria resulted in more variability between model runs. As shown by **Table 12**, while the number of DAS available shows little variability, the estimated DAS used showed more dispersion than in any other run. This suggests that the more characteristics that must be matched before a lease can occur, the order of transactions becomes more important.

<i>Tax</i>	<i>MA</i>	<i>ME</i>	<i>RI</i>	<i>NH</i>	<i>NY</i>	<i>NJ</i>	<i>CT</i>	<i>NC</i>	<i>DAS Available</i>	<i>Estimated DAS Used</i>	<i>DAS Leased</i>
N/A	24,923	6,285	3,529	2,573	2,407	1,352	511	432	43,332	36,832	0
0	25,861	6,574	3,289	2,844	1,940	1,062	454	416	43,333	38,290	4,767
0.1	25,581	6,509	3,258	2,789	1,930	1,052	449	411	42,859	37,759	4,769
0.2	25,233	6,489	3,236	2,834	1,917	1,015	425	406	42,411	37,282	4,625
0.3	24,930	6,411	3,203	2,775	1,952	1,015	424	405	41,972	36,748	4,544
0.4	24,700	6,309	3,181	2,724	1,941	1,015	427	407	41,560	36,240	4,438

Table 10 – Run 4 mean results summarized for eight homeport states.

<i>Tax</i>	<i>DAS Available</i>		
	<i>"0 to < 50"</i>	<i>"50 to < 75"</i>	<i>"75 and over"</i>
N/A	18,023	14,801	10,507
0	18,851	14,320	10,163
0.1	18,580	14,187	10,093
0.2	18,251	14,131	10,029
0.3	18,039	13,962	9,971
0.4	17,821	13,870	9,868

Table 11 – Run 4 mean results summarized by vessel length (feet)

<i>DAS Available</i>	<i>Tax</i>				
	<i>0</i>	<i>0.1</i>	<i>0.2</i>	<i>0.3</i>	<i>0.4</i>
40,750	0	0	0	0	0
41,000	0	0	0	0	0
41,250	0	0	0	0	0
41,500	0	0	0	0	0
41,750	0	0	0	0	300
42,000	0	0	0	288	0
42,250	0	0	0	12	0
42,500	0	0	298	0	0
42,750	0	0	2	0	0
43,000	0	300	0	0	0
43,250	0	0	0	0	0
43,500	300	0	0	0	0
More	0	0	0	0	0
<i>Estimated DAS Used</i>					
35,750	0	0	0	0	0
36,000	0	0	0	0	0
36,250	0	0	0	0	198
36,500	0	0	0	0	102
36,750	0	0	0	173	0
37,000	0	0	0	127	0
37,250	0	0	31	0	0
37,500	0	0	268	0	0
37,750	0	132	1	0	0
38,000	0	168	0	0	0
38,250	28	0	0	0	0
38,500	272	0	0	0	0
More	0	0	0	0	0

Table 12 – Run 3 results. Distribution of DAS available and estimated DAS used.

Conclusions

Subject to the data limitations and assumptions used in this model, the following general conclusions can be drawn:

- DAS leases or transfers will likely result in DAS moving from vessels with homeports in southern New England or Mid-Atlantic states to vessels with homeports in Maine, New Hampshire, and Massachusetts.
- DAS leases or transfers will likely result in DAS moving from larger vessels to smaller vessels.
- If tonnage is included as one of the parameters that must be matched before vessels can exchange DAS, it will make it more difficult for larger vessels to acquire DAS.

- A DAS leasing and transfer program will probably increase the number of DAS that are used. In order to reduce the risk that the number of DAS used will not exceed the number used without a leasing or transfer program, a “conservation tax” can be imposed. Different model assumptions result in the need for a different tax, but the four model runs described suggest that a tax of twenty percent may help keep DAS use at the level that may occur absent a leasing or transfer program. There is considerable uncertainty over this estimate, however, since there is limited experience with the current leasing program that can be used to evaluate the model assumptions.

Intentionally Blank