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1.0 ECONOMIC TRENDS IN THE SEA SCALLOP FISHERY

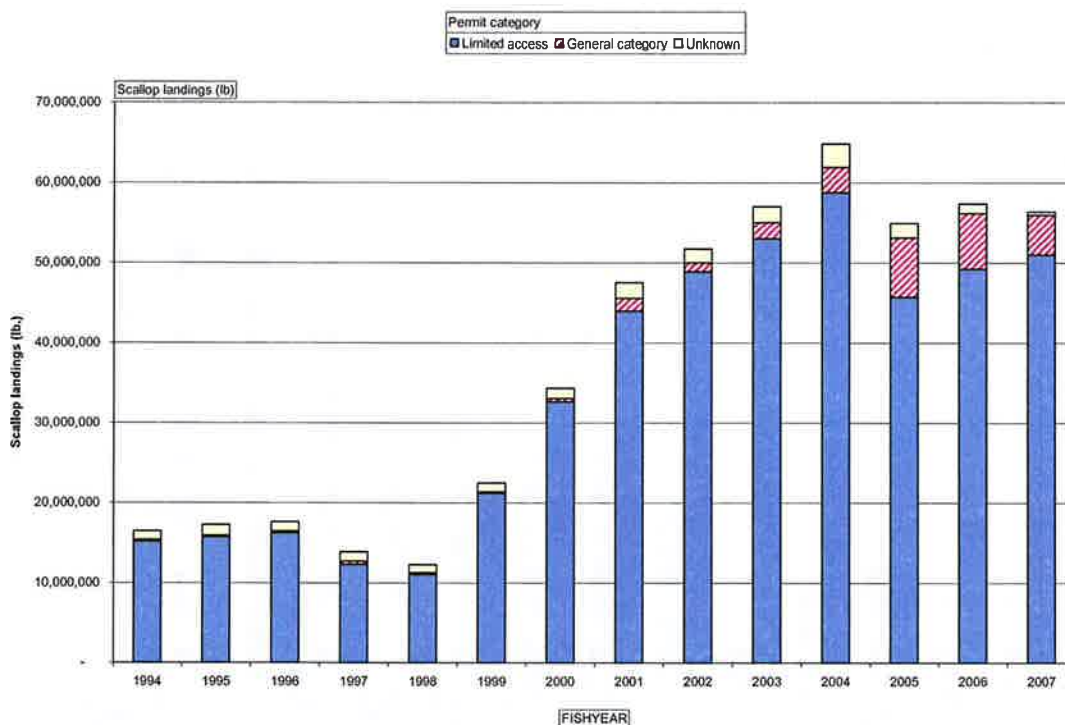
1.1 INTRODUCTION

This document describes the trends in landings, revenues, prices, producer surplus and profits for the sea scallop fishery since 1994, and as such, it provides a background for the economic analyses that will be conducted for Amendment 15 options. These preliminary empirical analyses will be revised with the updated data and extended to include the trends in employment, consumer surplus and total economic benefits for the scallop fishery.

1.2 TRENDS IN LANDINGS, PRICES AND REVENUES

In the last six fishing years (2002-2007) the landings from the northeast sea scallop fishery stayed above 50 million lb., surpassing the levels observed historically (Figure 1). The recovery of the scallop resource and consequent increase in landings and revenues was striking given that average scallop landings per year were below 16 million lb. during 1994-1998 fishing years, less than one-third of the present level of landings. The increase in the abundance of the scallops coupled with higher scallop prices increased the profitability of fishing for scallops by the general category vessels. As a result, general category landings increased from about less than 0.4 million lb. during the 1994-1998 fishing years to 5 million lb. or over during the last three fishing years (2005-2007), peaking to 7 million lb. in 2005 or 13.5% of the total scallop landings.

Figure 1. Scallop landings by permit category and fishing year (dealer data)



Data source and uncertainties: Figure 1 is based on the information obtained from the dealer database. The permit categories were not always identified correctly in the dealer data, such that some limited access landings were recorded incorrectly as “general category”. Based on the data review done in 2006, some corrections were made to the outlier data items. The data for the scallops landed in Connecticut, landings were shown as a sum of landings by all vessels regardless of the permit category. For that reason, the composition of landings in terms of the permit category cannot be identified for the ‘unknown’ category. The landings from Connecticut will be reported by permit after 2007 on (Greg Power e-mail).

Figure 2 shows that total fleet revenues for the limited access vessels tripled from about \$100 million in 1994 to over \$300 million in 2007 in inflation adjusted 2006 dollars. Scallop ex-vessel prices increased after 2001 as the composition of landings changed towards larger scallops that in general command a higher price than smaller scallops. However, rise in prices was not the main factor that led to the increase in revenue in the recent years compared to 1994-1998 and in fact, the inflation adjusted ex-vessel price of scallops in 2007 was lower than the price in 1994. The increase in total fleet revenue was mainly due to the increase scallop landings and the increase in the number of active limited access vessels during the same period. Figure 3 shows that average landings and revenue per limited access vessel more than doubled in recent years compared to the period 1994 -1998. The number of active vessels increased by 50 % (from about 220 in 1994 to 346 in 2007 fishing year) resulting in tripling of total fleet scallop landings and revenue in 2007 compared to 1994 (Figure 3).

Figure 2. Trends in total scallop landings, revenue and ex-vessel price by fishing year (limited access fishery only)

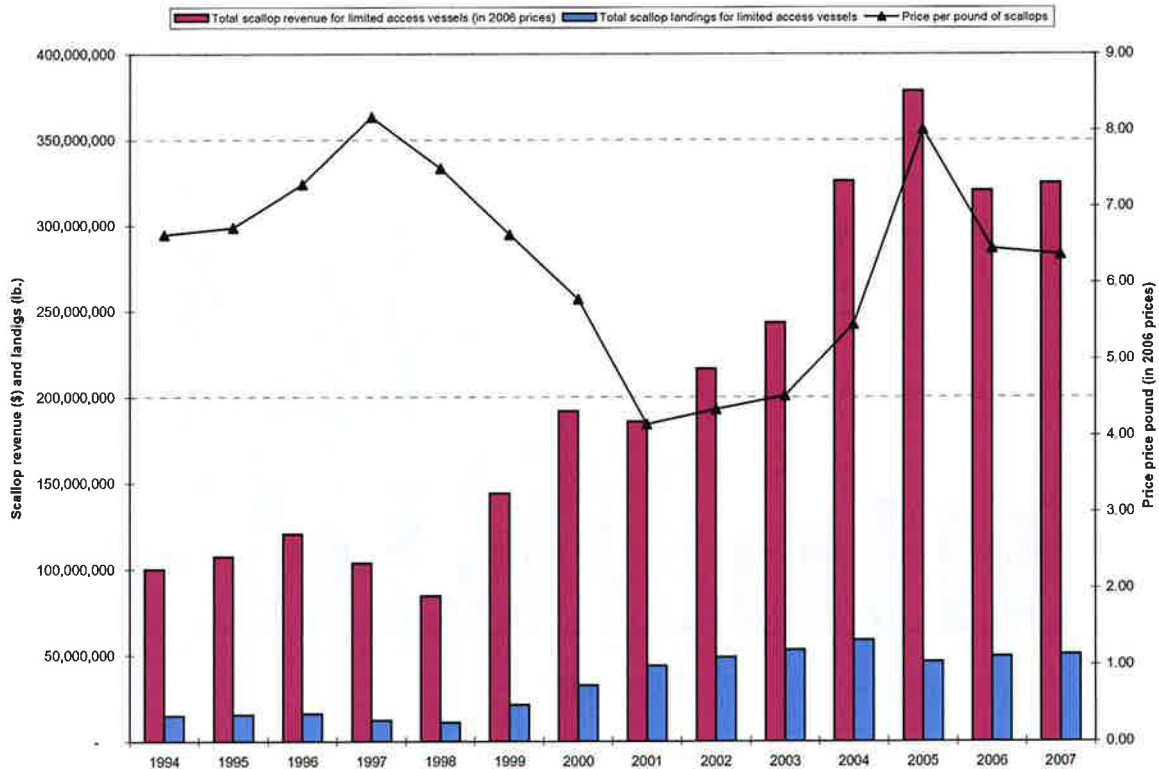
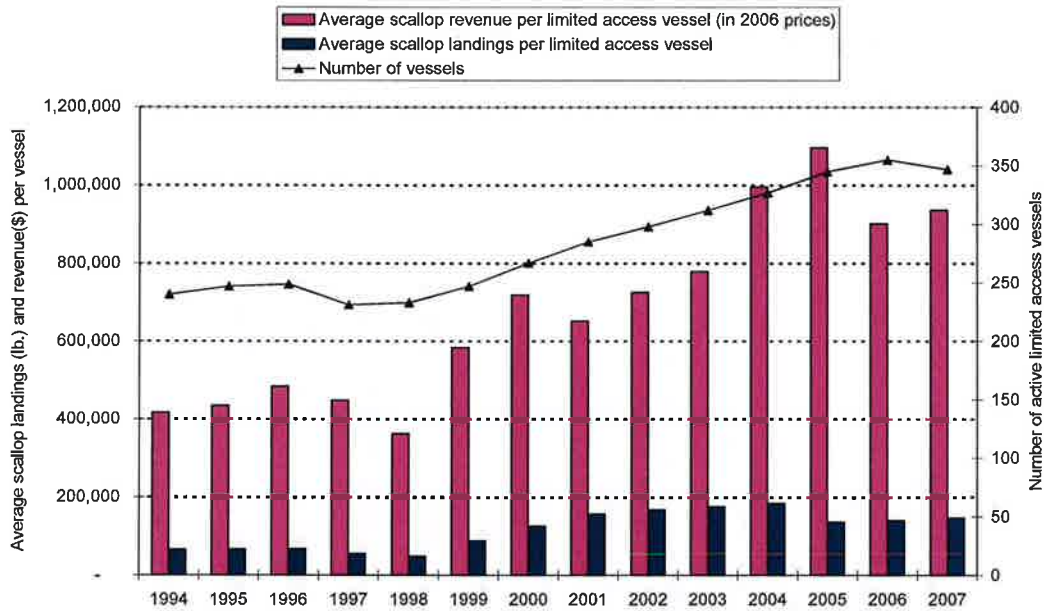


Figure 3. Trends in average scallop landings and revenue per full time vessel and number of active vessels (including full-time, part-time and occasional vessels)

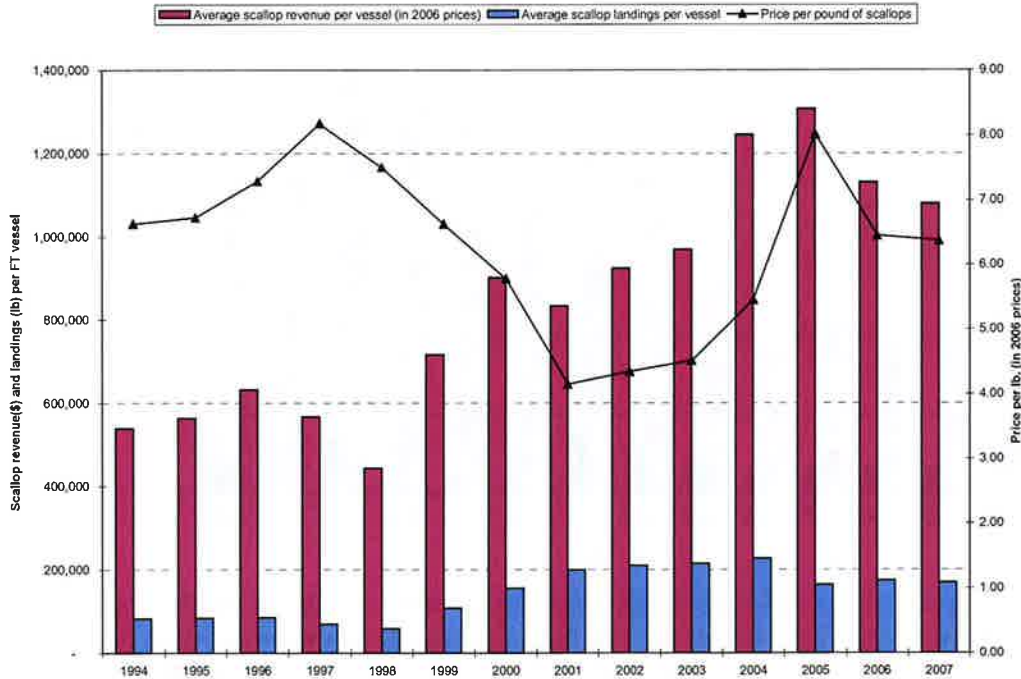


The trends in the revenues per full-time vessel were similar to the trends for the fleet as a whole. The following analyses shows the trends for 124 full-time vessels that were active in the scallop fishery for 14 years, that is, for every year from 1994 fishing year to the end of 2007 fishing year. In addition, each vessel in this group used more than 50% of their DAS allocation and average HP was 904 and GRT was 167 for this group of vessels. This group was selected so that the average trends will not be biased by including vessels that participated in the fishery only a few years, mainly in the recent years. For example, there were about 56 full-time vessels that were active for 4 years or less as of 2006 fishing year. These vessels had a lower fishing power (smaller HP and GRT), and as a consequence, had lower revenues and profits than the 124 full-time vessels included in the sample. Including these smaller vessels would reduce the average profits and revenues in the recent years relative to the earlier fishing years and would underestimate the increase in average profits per full-time vessel in recent years. Similarly, the full-time vessels that used less than 50% of their DAS allocation either because of choice or because of data inaccuracies are not included in the sample group of full-time vessels, because including them would either underestimate the average revenue or trip costs per vessel, resulting in lower profits in the first and higher profits in the second case.

Figure 4 shows that average scallop revenue per full-time vessel in the sample of 124 vessels doubled from about \$538,000 in 1994 to over 1,080,000 in 2007 despite the fact that inflation adjusted ex-vessel price per pound of scallops was slightly higher in 1994 (\$6.60 per pound) compared to the ex-vessel price in 2007 (\$6.40 per pound). In other words, doubling of the revenue was the result of the doubling of the average scallop landings per vessel in 2007 (Over 169,000 lb.) from its level in 1994 (over 81,500 lb.). The total fleet revenue for all the limited access vessels more than tripled, however, during the same years as new vessels became active

in the recent years as discussed above. Average scallop revenue per full-time peaked in 2005 fishing year to over \$1.3 million lb. as a result of higher landings combined with an increase in ex-vessel price to about \$8.00 per pound of scallops.

Figure 4. Trends in average scallop landings and revenue per full time vessel (sample of 124 vessels)



1.3 TRENDS IN EFFORT

1.3.1 Trends in DAS-used

There has been a steady decline in the total DAS-used by the limited access scallop vessels from 1994 to 2001 fishing year as a result of the effort-reduction measures of Amendment 4 (1994) and Amendment 7 (1999)). DAS allocations during this period were reduced almost by half from 204 DAS in 1994 to 120 DAS for the full-time vessels and in the same proportions for the part-time and occasional vessels from their base levels in 1994 (Table 1). As a result, DAS-used reached its lowest levels of about 22,550 days in 1999 and 2000 fishing years from about 34,000 days in 1994, even though the number of the number of full-time equivalent vessels increased during these years from 214 vessels in 1994 to 241 vessels in 2000 (Figure 5). Average DAS-used per full-time vessel declined from 161 days in 1994 to 93 days in 2000. The low levels of scallop abundance discouraged many vessels from fishing for scallops during those years.

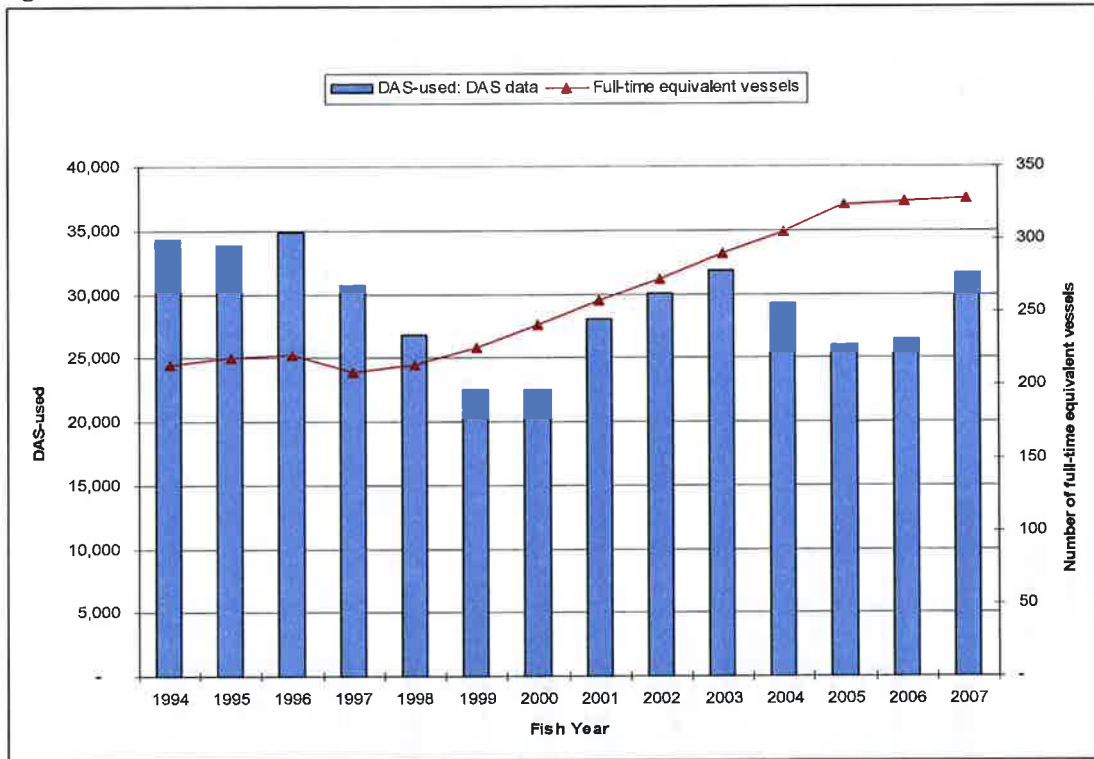
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Table 1. DAS and trip allocations per full-time vessel

Year	Allocations based on the Management Action	Total DAS Allocation (1)	Estimated Open area DAS allocations (2)	Access area trip allocations (3)	DAS charge or equivalent per access area trip (4)	Equivalent (estimated) DAS allocation for access areas (5)
1994	Amendment 4	204	None	None		None
1995	Amendment 4	182	None	None		None
1996	Amendment 4	182	None	None		None
1997	Amendment 4	164	None	None		None
1998	Amendment 4	142	None	None		None
1999	Amendment 7, Framework 11	120	90 to 120	3	10	0 to 30
2000	Framework 13	120	60 to 120	6	10	0 to 60
2001	Framework 14	120	90 to 120	3	10	0 to 30
2002	Framework 14	120	90 to 120	3	10	0 to 30
2003	Framework 15	120	90 to 120	3	10	0 to 30
2004	Framework 16	126	42 (MAX.62)	7	12	84
2005	Framework 16	100	40 (MAX.117)	5	12	60
2006	Framework 18	112	52	5	12	60
2007	Framework 18	111	51	5	12	60

(1) Total DAS allocation per full-time vessel represents a rough estimate for years 2004-07 since DAS is allocated for open areas only. DAS allocation for access areas is estimated by assuming an equivalent 12 day-at-sea allocation for each access area trip with a possession limit of 18,000 lb.

Figure 5. Total DAS-used and the number of active (full-time equivalent) vessels in the sea scallop fishery

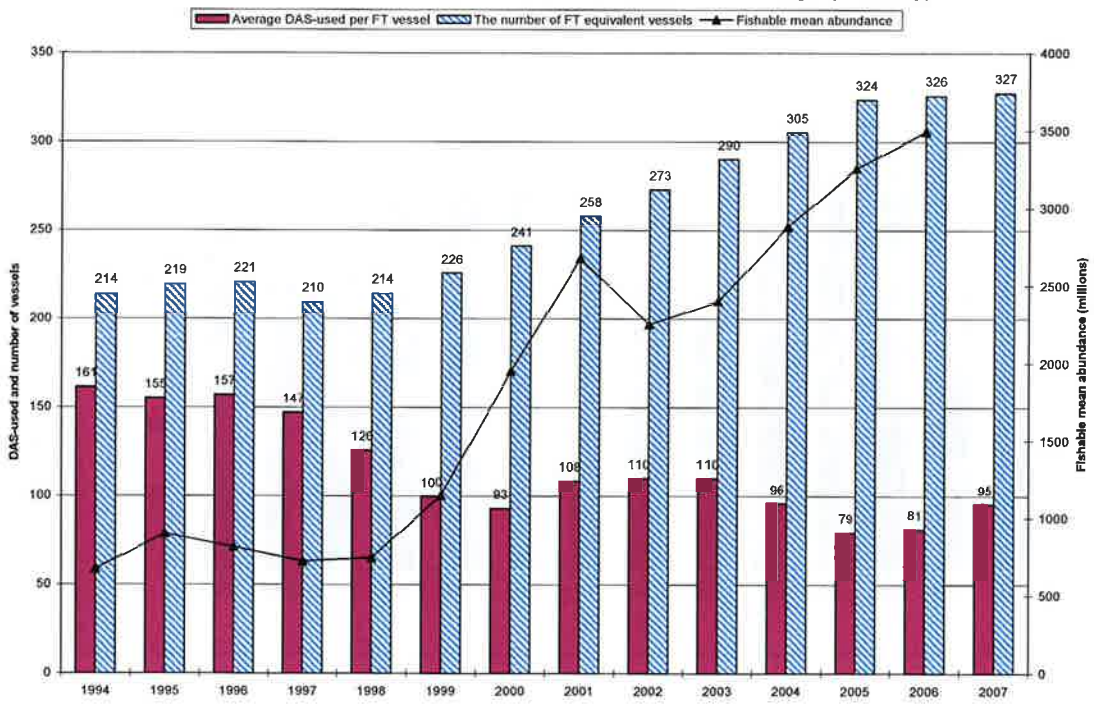


DAS Data sources: Reporting changes cause uncertainty in comparing trends in DAS-used.

1994-2003	SOLE	Enforce.FISHYY
2004-05	CUDA1	DAS.trips

After the fishing year 2000, however, the fishing effort started to increase as vessels spent more DAS for fishing and as more limited access vessels participated in the sea scallop fishery. The increase in total effort was mostly due to the increase in the number of vessels. The DAS-used per full-time vessel increased to 110 days during 2002-2003 fishing years from 93 days in 2000. This level was still significantly lower than DAS-used in the mid-1990's (over 150 days, Figure 6). During those years there was no change in the total DAS allocations (120 DAS per full-time vessel). The recovery of the scallop resource and the dramatic increase in the fishable abundance after 1999 increased the profits in the scallop fishery, thus led to increase in participation by the limited access vessels that remained inactive during the previous years. Georges Bank closed areas were opened to scallop fishing starting in 1999 by Framework 11 (CAII) and later by Framework 13 (CAII, CAI, NLS) encouraging many vessels to take opportunity in fishing those lucrative areas. Frameworks 14 and 15 provided controlled access to Hudson Canyon and VA/NC areas. As a result, 49 more new full-time equivalent vessels became active in the sea scallop fishery after 2000 during the next three fishing years. Total number of full-time equivalent vessels reached to a total of 290 vessels in 2003 and total fishing effort by the fleet increased to 31,800 days in 2003 from about 22,600 in 2000 (Figure 5).

Figure 6. Average DAS-used per full-time vessel, the number of full-time equivalent active vessels and fishable mean abundance in the sea scallop fishery (excluding general category fishery)



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Total fishing effort (DAS-used) declined after 2003 even though the number of active vessels increased to 326 vessels by 2006 from 290 vessels in 2003. With the implementation of Amendment 10 (2004) the limited access vessels were allocated DAS for open areas and number of trips for the specific access areas with no open area trade-offs. The open area allocations were reduced to 42 DAS in 2004 whereas full-time vessels were allocated 7 access area trips in the same year (Table 1, Framework 16). Even though total DAS equivalent allocations remained around the same levels during 2005-07 (at about 110 equivalent days, Table 1), the fishing effort, i.e., fleet DAS-used increased in 2007 fishing year as many vessels took their unused 2005 HCA trips in this year. If not for those HCA trips, the total effort in the scallop fishery would probably stay constant during 2005-07 with almost all qualified limited access vessels participating in the fishery.

1.3.2 Effort by open and access areas

Until 2004, DAS was allocated for the whole fishing area. Starting with Framework 16, DAS was allocated for the open areas only whereas for access areas the vessels received trip allocations. The unused Georges Bank controlled access area trips could be transferred to open areas due to the closure of access areas when yellowtail flounder catch reaches annual TAC. For example, a vessel that has taken two of three controlled access trips, may fish for 12 additional DAS in the open areas (totaling $42+12=54$ DAS for the fishing year). In 2004, the DAS allocation for open areas without access trips was 62 days, meaning that a vessel can transfer no more than 20 DAS from a closed controlled access to open areas. So a vessel that has taken only one of three or has not yet fished in a closed controlled access area, may transfer no more than 20 DAS to the open areas, totaling 62 open area DAS for the fishing year. Table 1 provides the maximum number of DAS that could have been used in open areas due to transferring DAS from unused controlled access trips. DAS transfers were allowed only for the Georges Bank access areas and would exclude Mid-Atlantic access areas. As a results of these transfers and carry-over DAS used by some vessels, average open area DAS-used by full-time vessels were about 52 days in 2004, and 44 days in 2005, higher than the base open area allocations in either year.

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Table 2. DAS-used and the number of trips by full-time vessels by area

AREA	DATA	FISHYEAR			
		2004	2005	2006	2007
ACCESS	Allocated number of trips	7	5	5	5
	Average DAS-used per vessel	45	37	30	49
	Average number of trips per vessel	6	5	5	8 *
	Average trip length	8	8	6	6
	Total number of trips	1636	1371	1386	2390
	Total DAS-used	12864	11039	8681	15492
	Number of full-time vessels fished	289	302	289	317
OPEN	DAS allocation per vessel	42	40	52	51
	Average DAS-used per vessel	52	44	54	46
	Number of trips	8	8	7	6
	Average trip length	8	7	8	9
	Total number of trips	2214	2360	2261	1749
	Total DAS-used	15328	13656	16915	14620
	Number of full-time vessels fished	293	312	317	319
ALL AREAS	Average DAS used per vessel	97	81	84	95
	Total DAS-used	28192	24695	25596	30112
	Total number of active vessels	293	312	317	319

(*) Because of carry-over trips taken in HCA in 2007, number of trips is greater than the number of allocated trips. See Table 4 below.

Framework 16 allocated 4 trips to HCA in 2004 and 3 trips to HCA in 2005 (18,000 lb. each). Because the catch rates were lower than expected in this area, many vessels chose to delay taking their 2005 access trips. For example, Table 4 shows that only 237 out of 312 active full-time vessels took some of their trips to HCA in 2005, averaging about 2.5 trips per vessel. Framework 18 extended Hudson Canyon access program – such that vessels that did not take their HC trips could take them in either 2006 and/or 2007. Many of these vessels postponed taking those trips until 2007. The number of trips shown could be larger than allocated since some of these trips are compensation trips. The use of HC trips in 2007 is the major reason behind the increase in total effort in 2007 compared to 2006 given that DAS allocations, number of access area trip allocations and the number of active vessels were similar in each year. Table 4 shows that about 5,500 DAS-used in HCA in 2005 which is almost equal to the difference in total effort in 2006 and 2007 fishing years. It also explains that on the average there were more access area trips taken per vessel in 2007 than the allocated 5 trips per vessel by F18. (8 trips per vessel that used that fished in the access areas whereas only 5 were allocated by Framework 18). Again, the inclusion of the compensation trips probably overestimates the number of HCA and other access area trips per vessel in Table 2 and Table 4 .

Table 3. Framework 18 DAS and access area trip allocations

Framework 18 allocations	Open area DAS per FT vessel	Controlled access area trips	Elephant Trunk	Hudson Canyon	Delmarva	Total DAS per FT vessel
DMV - 20K open area DAS in 2006 and 2007 (Proposed Alternative)						
2006	52	1 CAI, 2 CAII, 2 NLS (60 DAS)	Closed	2005 trips	Open	112
2007	51	1 CAI, 1 NLS, 3 ETA (84 DAS)	5 trips*	2005 trips	Closed	111

*Originally F18 allocated 5 trips to ETA which were reduced later to 3 by emergency action.

Table 4. DAS-used and the number of trips by full-time vessels in Hudson Canyon Access Area

Fishyear	Number of trips per vessel	Average DAS-used per vessel	Total DAS-used	Total number of trips	Number of full-time vessels fished
2004	4.1	34.0	9734	1163	286
2005	2.6	26.1	6181	605	237
2006	1.7	12.2	709	99	58
2007	2.8	24.0	5501	633	229

1.3.3 Trends in effective fishing effort and vessel characteristics

Figure 7. Number of limited access vessels by permit category

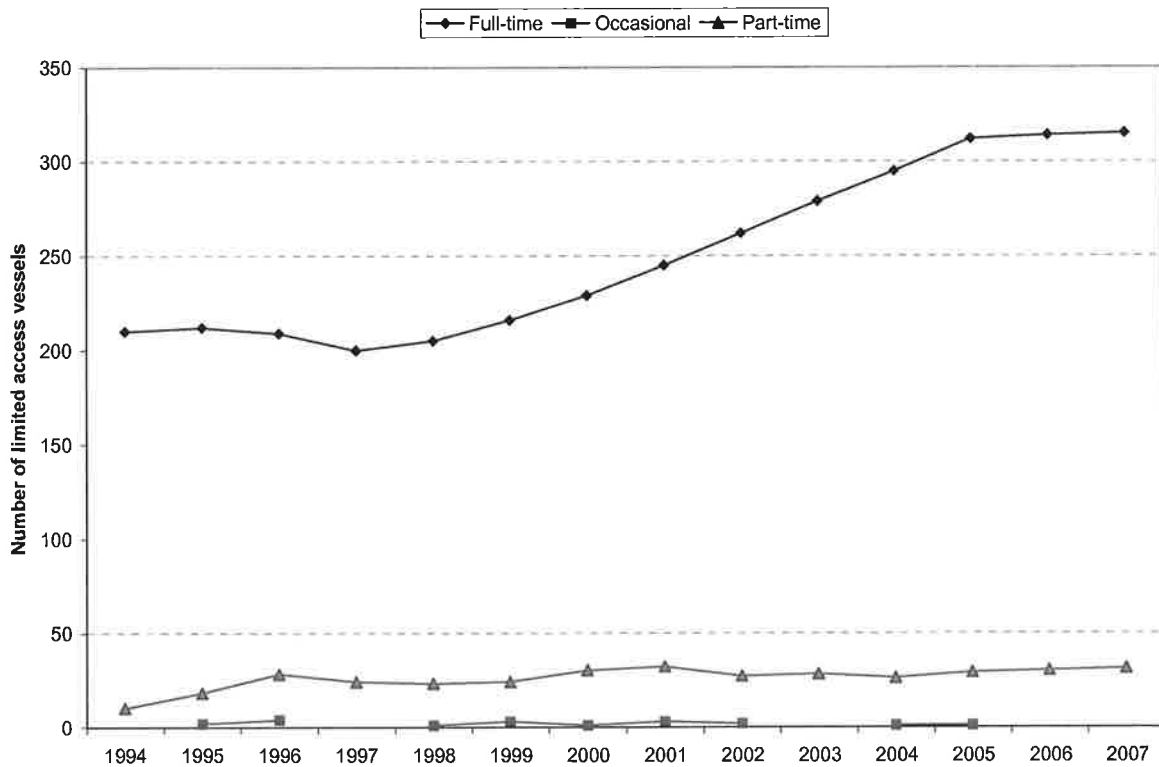
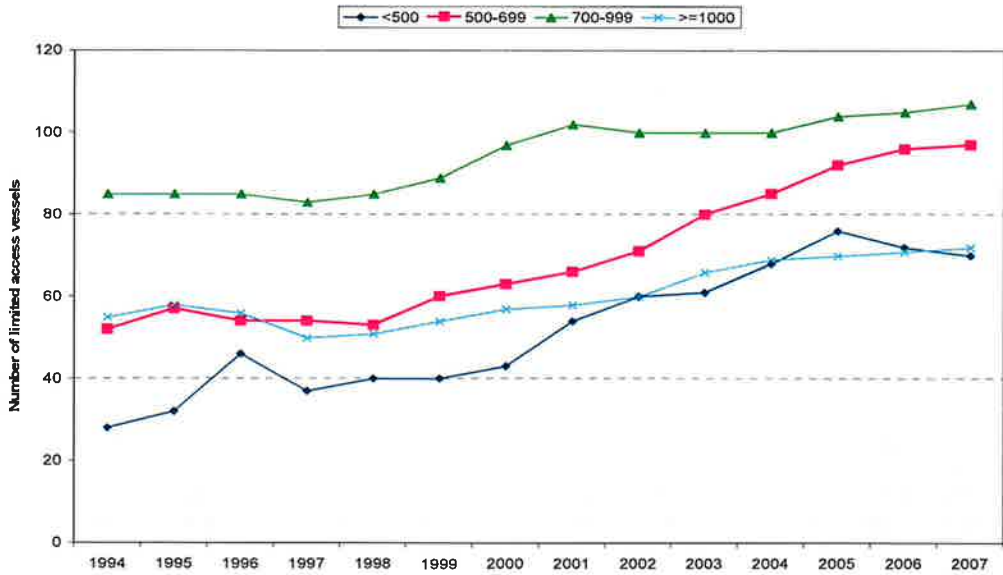


Figure 8. Number of full-time vessels by permit category



Figure 9. Number of limited access vessels by horsepower (including part-time and occasional vessels)



Majority of the small dredges had a horsepower of less than 500.

Table 5. Number of limited access vessels by years active

Number of vessels	Years Active				Grand Total
	FISHYEAR	<5 years	5-9 years	10-13 years	
1994	28	22	40	150	240
1995	22	24	51	150	247
1996	20	24	55	150	249
1997	6	22	53	150	231
1998	1	28	54	150	233
1999	3	35	59	150	247
2000	4	47	66	150	267
2001	4	67	64	150	285
2002	3	79	66	150	298
2003	4	92	66	150	312
2004	27	88	62	150	327
2005	55	86	54	150	345
2006	75	84	46	150	355
2007	84	79	34	150	347

There is a slight difference in trend for fishing effort weighted by horsepower from the total fleet DAS-used as Figure 11. Average HP, GRT and crew declined slightly from 1994 to 2007 because more small vessels became active in the fishery, reducing marginally the rise of HP weighted DAS-used compared to the total DAS-used in 2007 (Figure 10).

Figure 10. Average HP, GRT and crew size of limited access vessels

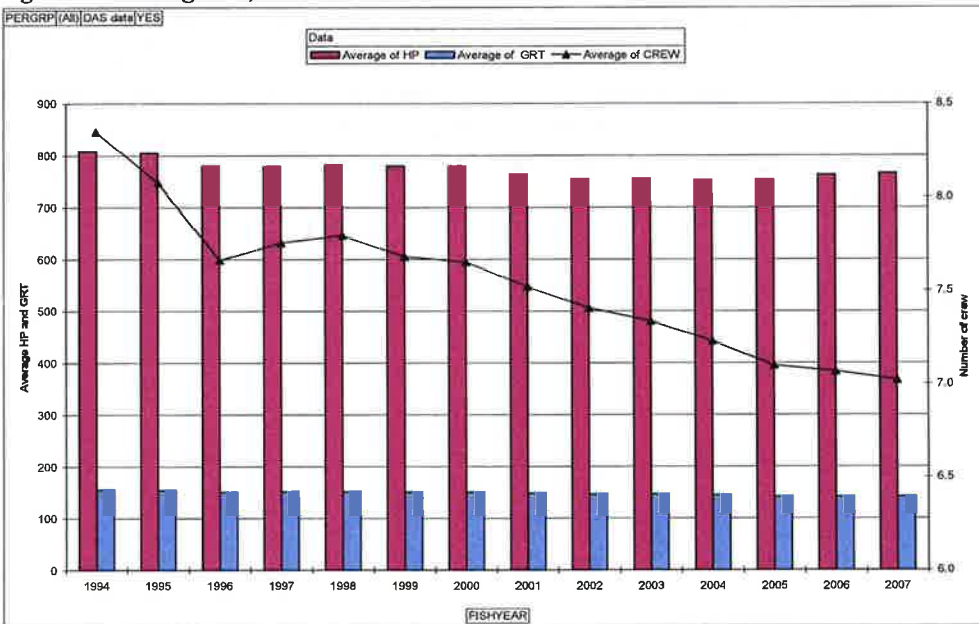


Figure 11. Trends in fishing effort by limited access vessels



1.4 TRENDS IN BIOMASS, LPUE AND PARTICIPATION

The annual average LPUE increased constantly after 1998 as the scallop resource recovered and fishable mean biomass increased from about 750 million in 1998 to over 3500 million in 2006 (Figure 12). Average LPUE for a full-time increased from 540 lb. per DAS in 1994 to over 2000 lb. per day in 2004, but declined afterwards to 1,700 lb. per DAS in 2007 (Table 6). The increased in scallop abundance provided incentive for new limited access vessels to participate in the fishery especially after 1999 fishing year, probably having a negative impact on the LPUE per vessel due to the increased competition for fish although the extent of this impact requires more analysis.

Figure 12. Fishable biomass, LPUE (annual landings/ DAS) and number of limited access vessels (all vessels)

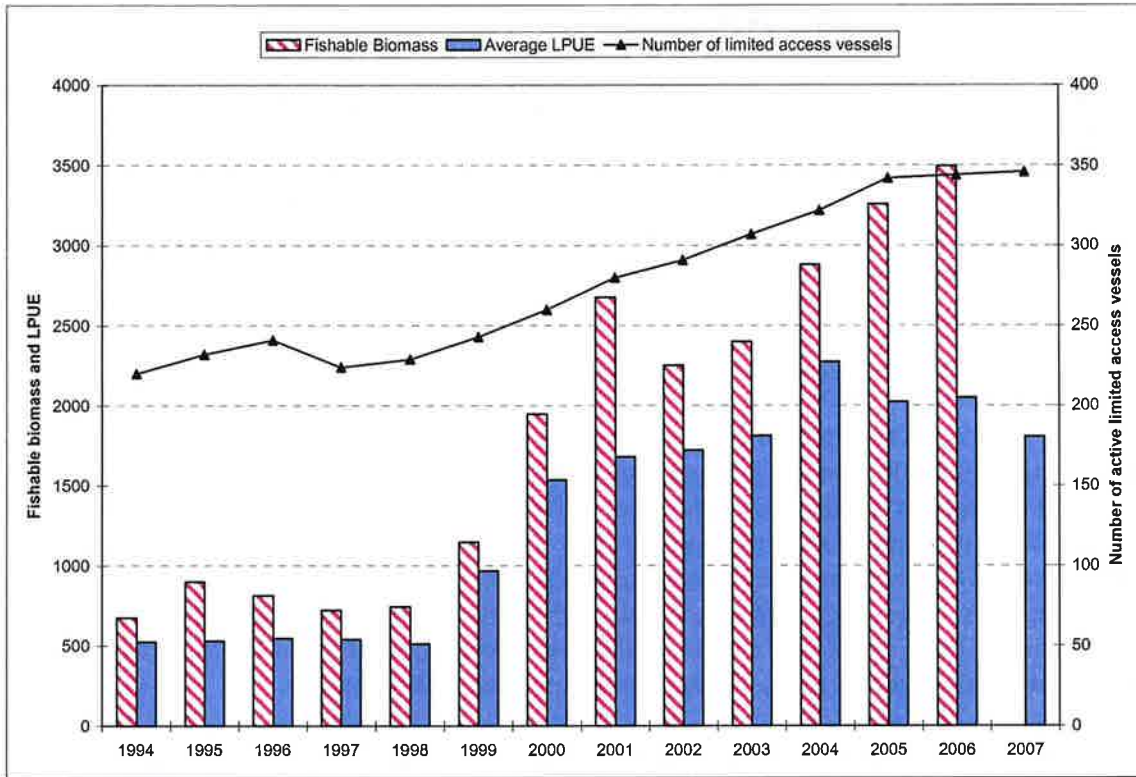


Table 6. Trends in LPUE for full-time vessels (including small dredge and scallop trawls) and fishable mean abundance

FISHYEAR	FT vessels that landed an average of less than 400 lb. of scallops per DAS as an average per year (Group A)	FT vessels that landed 400 lb. or more scallops per DAS as an average per year (Group B)	Average LPUE per full-time vessel (includes all vessels in Groups A and B)	Average LPUE per full-time vessel that landed 400 lb. or more scallops per DAS (Group B)	Maximum LPUE (Rounded numbers) All FT vessels)	Fishable mean abundance * (Whole stock, all sizes, millions)
1994	87	117	437	543	970	673
1995	57	148	471	540	850	900
1996	65	137	474	549	900	813
1997	107	87	414	537	1500	722
1998	97	103	416	517	750	744
1999	6	200	943	963	1800	1147
2000	Less than 5	219	1487	1504	2700	1948
2001	Less than 5	237	1604	1623	2700	2677
2002	Less than 5	254	1627	1638	3700	2250
2003	Less than 5	269	1691	1713	4700	2399
2004	6	284	2083	2124	4500	2881
2005	Less than 5	304	1856	1866	4700	3258
2006	9	302	1868	1918	4000	3495
2007	Less than 5	307	1693	1714	3800	NA

* 45th Stock Assessment Report for Atlantic Sea Scallops (Sept, 2007), Table B5-5, p.183.

1.5 TRENDS IN FISHING COSTS

This section provides information on the variable and fixed costs of fishing for both general category and limited access vessels. Fishery management measures not only affect the level of landings and prices of fish, but also have an impact on the trip and operating costs of fishing. The restrictions on the number of days-at-sea vessels can fish in a given year, or on the number of trips the vessels can take to certain areas, and/or the restrictions on the number of crew are examples of measures that can reduce or increase those expenses. Since costs constitute a fundamental part of the producer surplus, crew shares and profits, the evaluation of net national benefits, the analysis of economic impacts require an estimation of these costs.

1.5.1 Trends in Variable Costs for limited access vessels

Variable and fixed costs for the limited access scallop vessels were updated using the observer cost data for the 1994-2007 period. The variable costs for a scallop vessel are defined as those expenses that increase or decrease with the level of fishing activity. The trip costs include food, ice, water, oil and fuel, and are usually paid by crew in the scallop fishery out of their shares from the gross stock. Other variable costs include expenses on gear and supplies such as gloves, knives, twine, links, rings, bags, bag ties, towels, light bulbs, scallop oil slickers, paper towels, cups, plates, paint, links, twine and chain. All the costs were adjusted for inflation using CPI (includes commodities such as food, oil, fuel) and expressed in 2006 prices.

Table 7 summarizes fishing costs for limited access scallop dredge vessels (excluding the small dredge vessels) based on the observer cost data during the 1994-2007 fishing years. The average variable costs shown in this Table should be considered as rough estimates since their values are affected by the numbers and the characteristics of the vessels included in the observer data. For example, Table 7 shows that average fuel and trip costs are slightly higher for the 1994 -2001 period compared to the costs in 2002 fishing year. This is probably because the observer cost data included larger vessels in this year with an average GRT of 164 and HP of 993 compared to the sample of vessels in 2002-07 fishing years. The composition of the observer data in terms of the vessel GRT and HP were similar for the 2002-2007 period, however. It is clear that fuel costs increased during this period as fuel prices more than doubled from \$1.13 per gallon in 2002 to \$2.42 per gallon in 2007. As a result, average trip costs per DAS including fuel, food, oil, water, ice and supplies doubled in 2007 (\$1,540 per DAS) compared to its level in 2002 (\$748 per DAS) as the share of fuel expenses in total trip costs increased from 60% in 2002 to 79% in 2007 (for the sample of vessels included in the data).

Fishing costs also vary with the vessel gross tonnage, horsepower and crew size as shown in Table 8 and Table 9. Table 8 shows that the average costs for full-time small dredge and trawl vessels are considerably less than the full-time scallop dredges. It is difficult to reach a conclusion regarding the trends in trip costs over time for these vessels, however, since a different number of vessels with varying gross tonnage and horsepower were included in the cost data for each year. The trips costs are significantly higher for full-time limited access vessels that have a 150 GRT or more compared to smaller vessels as these vessel have almost double of the horse power of the smaller vessels (Table 9.). Table 10 shows that vessels with a higher horse power have larger trip costs compared to the vessels that have a smaller engine power. The cost

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model described in Section **Error! Reference source not found.** takes into account these differences in vessel characteristics.

Table 7. Trip costs per limited access full-time vessel (scallop dredge) during 1994-2007 (in 2006 inflation adjusted prices)

Data	Fishyear						
	1994-2001 (average)	2002	2003	2004	2005	2006	2007
Number of unique vessels	41	26	41	86	53	49	46
Number of observed trips	164	34	69	123	84	75	71
GRT	164	162	157	155	151	154	153
HP	993	859	818	879	820	849	875
Crew	6.3	6.9	6.9	6.9	6.2	6.6	6.6
DAS per trip	11.2	8.8	10.6	8.6	7.9	8.3	10.0
Average fuel costs per DAS (\$)	510	448	527	666	823	984	1210
Average of food costs per DAS (\$)	147	174	167	168	192	194	150
Other trip costs (Ice, water, supply, oil)	107	126	149	182	131	173	180
Average total trip costs per DAS (\$) Including supply costs	764	748	843	1016	1146	1351	1540
Average fuel price (nominal)	1.03	1.13	1.19	1.54	2.13	2.07	2.42
Fuel costs as a % of total trip costs	67%	60%	63%	66%	72%	73%	79%
Average damage costs per DA	58	64	73	47	24	85	75
Average total trip costs per DAS (\$) Including supply and damage costs	822	812	916	1063	1170	1436	1615

Table 8. Trip costs per limited access for full-time scallop small dredge and trawls during 1994 -2007 (in 2006 inflation adjusted prices)

Data	Fishyear					2003-07 Average
	2003	2004	2005	2006	2007	
Number of observed trips	4	15	12	22	12	65
GRT	168	131	131	106	103	120
HP	738	581	612	471	441	533
Crew	6.5	5.4	4.4	4.3	4.7	4.8
DAS per trip	13.3	8.9	5.8	5.5	7.2	7.1
Average fuel costs per DAS (\$)	845	436	655	852	577	675
Average of food costs per DAS (\$)	132	256	138	95	176	158
Other trip costs (Ice, water, supply, oil)	86	152	174	87	157	121
Average total trip costs per DAS (\$) Including supply costs	1062	844	967	1034	910	955
Average fuel price (nominal)	1.26	1.40	2.17	2.12	2.25	1.93
Fuel costs as a % of total trip costs	80%	52%	68%	82%	63%	71%

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Table 9. Average trip costs per limited access full-time vessel (including small dredge and trawls) by gross tonnage during 2002 - 2007 (in 2006 inflation adjusted prices)

Data	Gross Tonnage			
	<=50 GRT	51-100 GRT	101-150 GRT	>150 GRT
Number of trips	8	47	190	250
Average gross tonnage	42	87	129	180
Average horse power	361	510	675	986
Average crew	4.9	5.4	6.3	6.8
Average DA per trip	4.5	6.3	8.0	10.1
Average fuel costs per DA	484	587	647	917
Average food costs per DA	107	132	160	186
Other trip costs (Ice, water, supply, oil)	186	125	146	169
Average total trip costs per DAS (\$) Including supply costs	754	829	924	1233
Fuel costs as a % of total trip costs	67%	71%	71%	71%

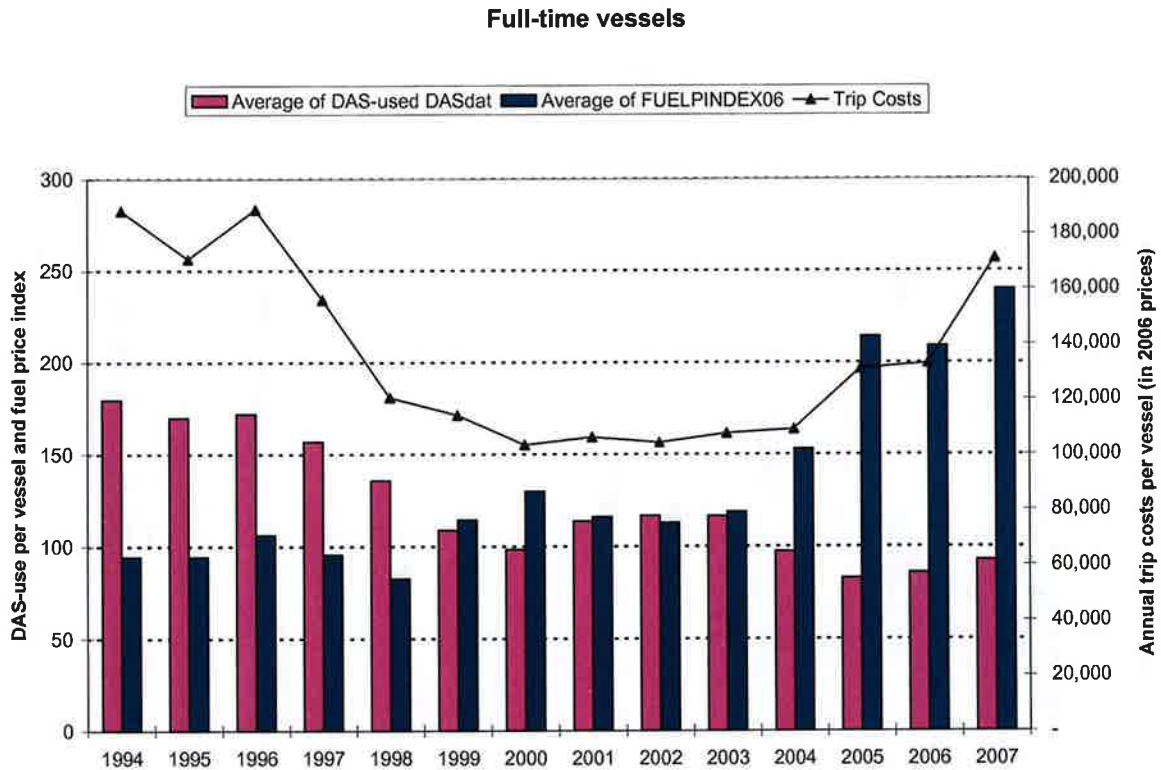
Table 10. Average trip costs per limited access full-time vessel (including small dredge and trawls) by horse power during 2002 - 2007 (in 2006 inflation adjusted prices)

Data	Horse Power		
	<700	700-999	>=1000
Number of trips	204	155	136
Average gross tonnage	122	163	176
Average horse power	526	817	1233
Average crew	6.1	6.5	6.8
Average DA per trip	7.7	9.0	10.3
Average fuel costs per DA	630	773	1001
Average food costs per DA	165	169	177
Other trip costs (Ice, water, supply, oil)	155	146	173
Average total trip costs per DAS (\$) Including supply costs	947	1052	1296
Fuel costs as a % of total trip costs	69%	71%	74%

1.5.2 Trends in trip costs, DAS-used and fuel prices

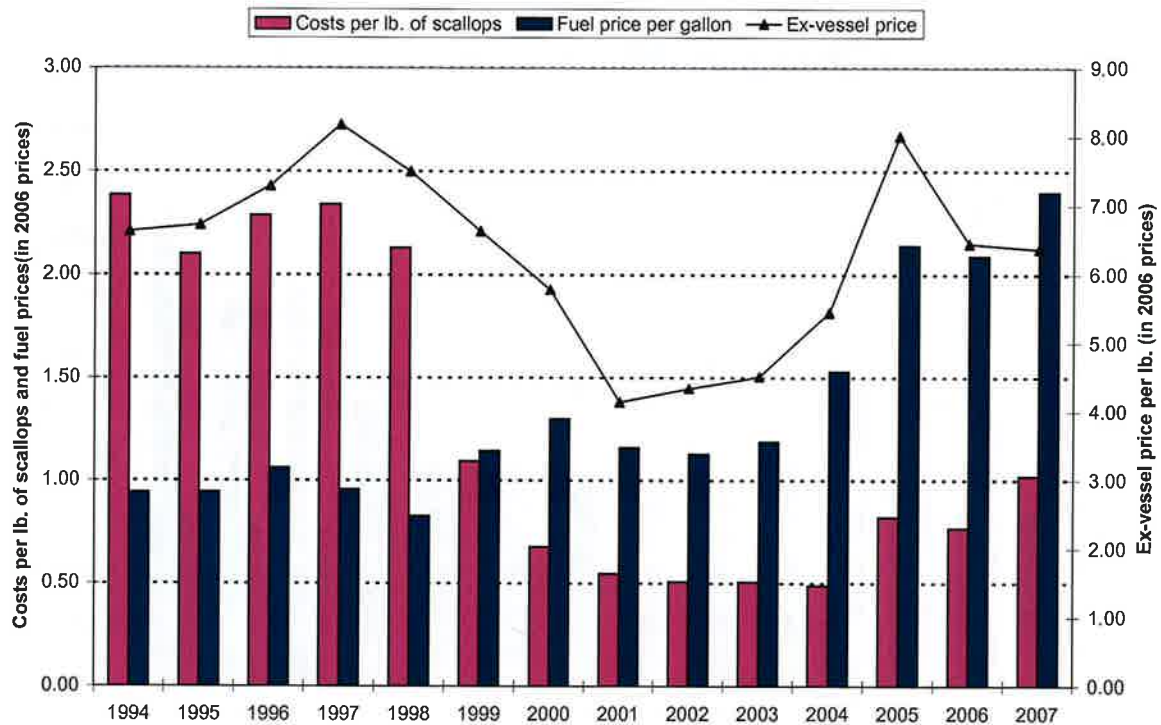
Estimated value of the annual trip costs declined from about \$190,000 to about \$100,000 per full-time vessel during the period 1994-2000 as fuel prices remained relatively low and as DAS-used per vessel declined from about 180 days to 98 days-at-sea and remained relatively stable until 2004 fishing year. The increase in fuel prices starting with 2004 fishing year, however, resulted in an increase in the trip costs even though the DAS-used per full-time vessel declined below 100 days-at-sea. Consequently, the annual trip costs per full-time vessel jumped to over \$170,000 in 2007. The cost equation used in the estimation of the annual trip costs is described in the document "Methods for Economic Analysis".

Figure 13. Trends in fuel prices, DAS-used and average estimated annual trip costs per full-time vessel



Average trip costs per pound of scallops were estimated to be over \$2.00 per pound of scallops during the period 1994 -1998 because of the decline in LPUE during this period. Rebuilding of the scallop resource coupled with relatively lower fuel prices during 1999-2004 lead to a decline in trip costs per pound of scallops to less than 50 cents in 2004. The jump in fuel prices reversed this trend and increased the trip costs above \$1.00 per pound of scallops in 2007.

Figure 14. Fuel and ex-vessel prices and estimated costs per pound of scallops (in 2006 prices)



1.5.3 Trends in fixed costs for limited access vessels

The fixed costs include those expenses that are not usually related to the level of fishing activity or output. These are insurance, maintenance, license, repairs, office expenses, professional fees, dues, and utility, interest, and dock expenses. The expenses on insurance, maintenance, repairs and replacement of engine, electrical and processing equipment, gear and other equipment are obtained from the observer data. Observer data does not include expenses in license, professional fees, dues, utility, interest and dock expenses. In the estimation of profits, allowance was made for these items using the results of a study conducted by Daniel Georgianna et.al. (1999).

Average fixed costs were about \$161,819 for limited access full-time vessels for the period 2001-2007, excluding trawls and small dredges (Table 11, in 2006 prices). This table includes only those observations for which data on all items of fixed costs were available. It must be cautioned that these costs do not include interest payments on mortgage, and a variety of other expenses such as office expenses, accounting and bank fees. Therefore, actual fixed costs of vessels could be higher than these numbers shown in the following Tables. Because of the different sample size and different size of vessels included each year in the cost data, it is not possible to reach a conclusion regarding the trend in these costs based on the averages provided

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in these Tables. Table 12 and Table 13 indicate, however, that the fixed costs are larger for vessels that have a larger gross tonnage compared to smaller vessels.

Table 11. Annual fixed costs for full-time limited access scallop vessels by year (in 2006 inflation-adjusted prices and includes only those observations for insurance cost was available)

Data	2001	2002	2003	2004	2005	2006	2007	2001-2007
Number of vessels	7	20	36	50	40	24	39	216
Maintenance (\$)	96,659	52,308	79,108	49,953	69,048	91,045	38,717	63,452
Repairs and replacement (\$)	86,912	65,400	81,452	73,349	44,287	38,714	33,414	58,283
Insurance (\$)	40,980	35,127	60,501	57,117	61,933	65,896	62,129	57,941
Total fixed costs (\$)	224,552	141,719	206,304	155,711	159,542	171,252	122,631	161,819
GRT	148	156	157	156	156	144	150	153
HP	876	799	832	825	813	792	840	822

Table 12. Annual fixed costs of limited access scallop vessels (all permit categories included) by ton class (in 2006 prices, including only those observations for which insurance data were available).

Data	51-100 GRT	101-150 GRT	>150	Average (2001-2007)
Number of vessels	43	93	123	259
GRT	70	130	180	144
HP	417	673	957	767
Maintenance (\$)	27,635	55,446	70,585	57,746
Repairs (\$)	34,089	43,516	70,255	54,101
Insurance (\$)	31,176	45,872	65,295	52,731
Total fixed cost (\$)	87,582	132,794	182,652	149,186

Table 13. Annual fixed costs of full-time limited access scallop vessels by ton class (2006 inflation adjusted prices, including only those observations for which insurance data were available)

Data	51-100 GRT	101-150 GRT	>150	Average (2001-07)
Number of vessels	18	75	123	216
GRT	75	129	180	153
HP	461	690	957	822
Maintenance (\$)	32,657	60,145	70,585	63,452
Repairs (\$)	26,152	47,860	70,255	58,283
Insurance (\$)	46,784	48,615	65,295	57,941
Total fixed cost (\$)	100,780	142,482	182,652	161,819

1.5.4 Trends in Variable costs for general category vessels

There were a total of 458 observations included in the data for 197 unique vessels with general category permit. Most of the data were collected in 2005 (247 observations) as shown in Table 14. It is difficult to reach a conclusion regarding the trends in trip costs over time since a different number of vessels with varying gross tonnage and horsepower were included in the cost data for each year. For example, observer data for 2002 included only 4 small general category vessels with an average 15 gross tons, considerably smaller than the 87 general category vessels included in 2005 sample avergaing 94 gross tons. However, there has been an increasing trend in the fuel costs and total trip costs per DAS folloiwng the increase in fuel prices. For example,

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average trip costs increased from \$268 per day-at-sea in 2004 to \$487 per day-at-sea in 2006 as fuel prices increased from \$1.5 per gallon in 2004 to \$2.3 per gallon in 2006.

Table 14. Trip characteristics per general category vessel during 2002-2007 (in 2006 inflation adjusted prices)

Data	Year					
	2002	2003	2004	2005	2006	2007
Number of observed trips	5	6	96	247	96	8
Number of unique vessels	4	4	42	87	54	6
GRT	15	59	59	94	75	78
Horsepower	310	431	424	483	424	525
Crew	3.0	2.5	3.0	3.4	3.0	2.7
DAS per trip	1.3	1.4	1.5	1.7	2.0	2.0
Scallop lb. per trip	317	358	424	376	369	370
Scallop lb. per DA	283	274	247	240	206	209
Average fuel costs per DAS (\$)	58	171	227	317	374	323
Fuel costs as a % of total trip costs	64%	79%	86%	84%	77%	94%
Average of food costs per DAS (\$)	22	31	20	27	31	14
Other trip costs (Ice, water, supply, oil)	13	15	21	33	83	7
Average trip costs per DAS (\$)	93	217	268	376	487	343
Average fuel price (nominal)	1.0	1.0	1.5	2.1	2.3	2.1

*Using annual PPI for the fish year for all finished goods (used seasonally adjusted monthly numbers to derive PPI for the fish year).

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Table 15. Landings and trip costs by gross tonnage during 2005-07 (in 2006 inflation adjusted prices)

Permit category	Data	<50 GRT	50-99 GRT	>=100 GRT	All vessels (2005-07 average)
General category	Number of trips*	28	16	43	87
	Average DA per trip	1.7	1.9	1.9	1.8
	Average gross tonnage	28	74	122	83
	Average horse power	393	442	477	444
	Average crew	2.6	3.4	3.5	3.2
	Average scallop lb. per trip	352	391	378	372
	Average scallop lb. per DA	239	242	234	237
	Average fuel costs per DA	236	331	353	311
	Average total trip costs per DA	435	449	453	446
Limited access	Number of trips*	5	18	79	102
	Average DA per trip	4	6	10	9
	Average gross tonnage	36	80	161	140
	Average horse power	381	446	874	775
	Average crew	5	5	6	6
	Average scallop lb. per trip	2,121	5,178	16,056	13,704
	Average scallop lb. per DA	494	589	1,428	1,254
	Average fuel costs per DA	594	542	1,099	976
	Average total trip costs per DA	894	877	1,553	1,402

- Includes only those trips for which cost data was available. Note that the number of trips will be less than provided in
- Table 14 and Table 7.

1.5.5 Trends in fixed costs for general category vessels (SAFE 2007)

Table 16. Annual fixed costs for general category scallop vessels by year (In 2006 inflation-adjusted prices)

Data	2002	2003	2004	2005	2002-05 Average
Number of vessels	26	40	90	143	299
GRT	65	81	81	84	81
HP	384	433	444	461	445
Insurance (\$)	18,195	22,704	23,908	25,739	24,512
Maintenance (\$)	32,321	27,204	33,311	30,343	31,377
Repairs and replacement (\$)	36,691	33,573	34,951	28,209	31,975
Total fixed cost (\$)	87,206	83,481	92,170	84,293	87,864

*Note: only those observations for which data on all items, i.e. insur, maint. and repairs was available included in these Tables. A few outliers are eliminated.

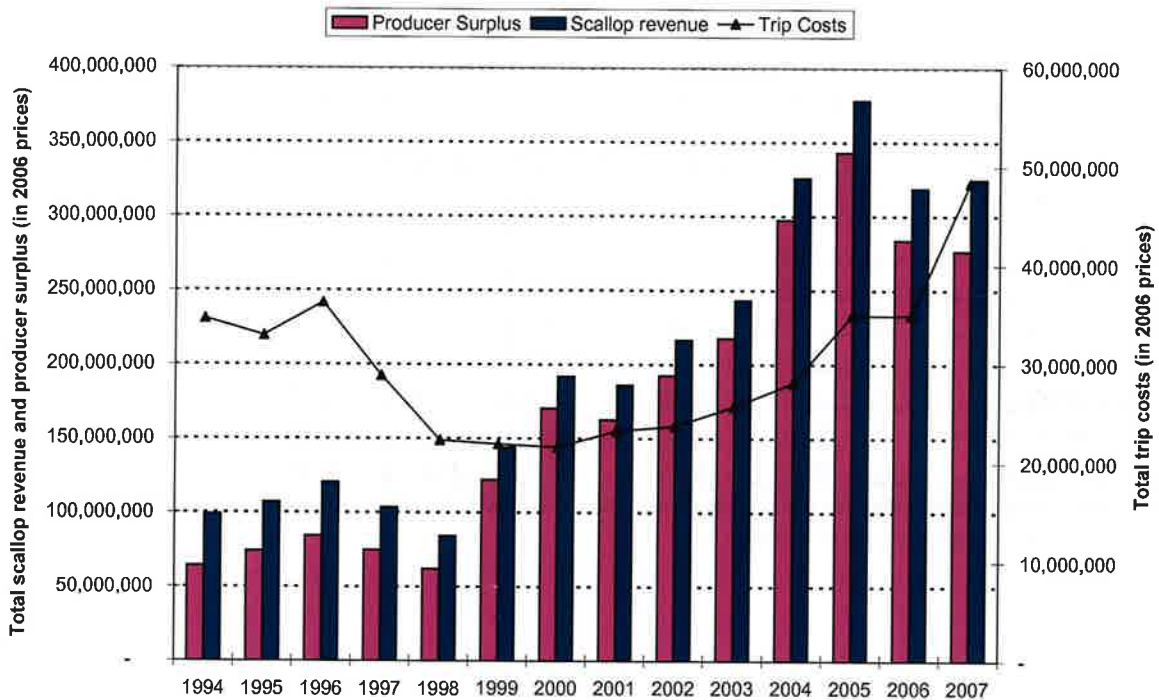
Table 17. Annual fixed costs of active general category vessels by ton class (in 2006 inflation-adjusted prices)

Data	<=50 GRT	51-100 GRT	101-150 GRT	>150	Grand Total
Number of vessels	114	68	89	28	299
GRT	24	77	129	166	81
HP	338	383	553	690	445
Maintenance (\$)	9,442	24,811	38,946	42,042	24,512
Repairs (\$)	15,773	35,542	47,703	38,573	31,377
Insurance (\$)	24,840	25,946	47,528	33,724	31,975
Total fixed cost (\$)	50,055	86,297	134,178	114,339	87,864

1.6 TRENDS IN PRODUCER SURPLUS AND PROFITS

Producer surplus is a main component of the net economic benefits from an industry and estimated as the difference between total revenue minus the variable (i.e., trip costs). Despite the increase in the trip costs in recent years, total estimated producer surplus increased significantly from less than \$75 million in 1994 to \$275 million in 2007.

**Figure 15. Total scallop fleet revenue, trip costs and producer surplus (in 2006 inflation adjusted prices)
All limited access vessels**



1.6.1 Trends in FULL-TIME Vessel revenues, costs, profits and crew income

This section analyzes the trends in revenues, costs, profits and crew income for full-time limited access vessels to reflect the trends in profits for the sea scallop fishery. Since part-time and occasional vessels have other sources of fishing revenue, their profits wouldn't reflect the trends in the sea scallop fishery accurately, thus excluded from the analyses presented below. Overall, the number of active full-time vessels ranged from 201 (1997) to 319 (2006) vessels.

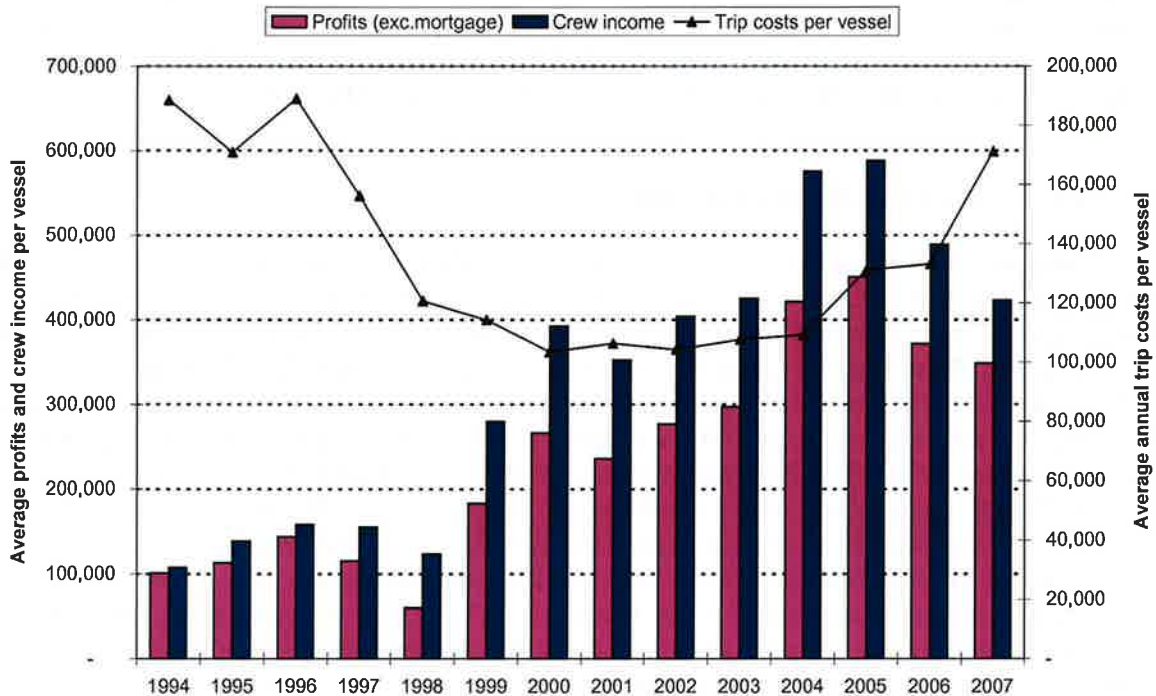
1.6.2 Trends in profits and crew income

It is assumed that crew shares are determined by a 55% split for the crew and 45% for the owner. Trip expenses such as fuel, food, ice, oil, and water are paid from the crew share. Boat owner pays for repairs, insurance, and the mortgage of the vessel. According to a study done by Daniel Georgianna and Debra Shrader (2, 2005), crew shares dropped from 59% in 1993 to 55% in 2002. In addition to the usual trip expenses, some scallop crew members reported that the cost of transponders, a new expense since 1994, was also paid from the gross stock. Others reported that captains' bonuses (10% of the boat share) were paid from the owner's share before DAS and are now paid from the gross stock, which would reduce the crew share. The payments to the Fisheries Survival Fund (\$500 per trip) were paid from the gross stock rather than from owners share according to some crew members. There could be other expenses, such as shovels that might be taken out of the crew share rather than the boat's share or the gross stock. The analysis below would overestimate the crew income because the cost transponders (must be service costs and fisheries survival fund payments are not taken into account. However, it is assumed that crew share include captains' and other bonuses. Georgianna (2005) indicated that in 2002 annual income for the full-time fishermen was about \$53,000. This number is consistent with our results, which is estimated to be \$51,429 per crew for the same year.

The gross profits per vessel are estimated as the boat share (after paying crew shares) minus the fixed expenses such as maintenance, repairs and insurance (hull and liability). Both the trip costs and fixed costs are estimated using the cost models presented in document "Methods for Economic Analysis". When these models are applied to the entire fleet of full-time vessels the average fixed costs per vessel was about \$125,000 and \$140,000 for the sample 124 vessels. The inflation adjusted value of the fixed cost is assumed to stay constant for each year. Although Table 11 above showed that these costs varied from one year to another, this was mostly due to the characteristics of the vessels included in the cost data and there was no noticeable trend indicating an increase in fixed costs. The regression model coefficients for the trend or for Fleet LPUE were also insignificant.

The results show that average gross profit for these 124 sample vessels tripled from about \$100,000 in 1994 to over \$300,000 in 2007 (Figure 16). Along with the gross scallop revenue per vessel, gross profits per full-time vessel peaked in year 2005, but declined in 2006 and 2007 as trip costs per vessel increased due to the rise in fuel prices and as scallop revenue declined from falling ex-vessel prices. Average DAS-used per FT vessel also increased slightly from 2005 to 2007 (Figure 6).

Figure 16. Average gross profits and crew income and trip costs per vessel for a sample of 124 full-time vessels.



However, the gross profits may be an overestimate since estimated costs do not include other costs such as loan payments, transportation costs, office expenses, professional fees and accounting, dock fees or taxes because these items are not included in the observer cost data. According to a study by Daniel Georgianna et.al (1999), these other costs excluding loan payments amounted to about \$33,000 in 1997, or about 41,600 in 2006 prices for scallopers greater than 70 feet in length. According to the cost model, estimates for the same group of total fixed costs including insurance, maintenance and repairs averaged to \$136,500 for the same year for the same group of vessels (i.e., in 1997, in terms of 2006 prices). Adding these other cost items (\$41,600) would increase the total costs by about 30% to \$178,100. In order to calculate the effect of other items on profits, adjusted profits are calculated for all vessels with the fixed costs adjusted upwards by 30%. This assumption has the limitation, however, that these cost items may not be 30% of the overall fixed costs for each vessel. There was no separate data on these cost items (office expenses, professional fees and accounting, dock fees or taxes) for the medium and small vessels, however. Therefore, values of adjusted profits should be interpreted with caution indicating, at the best, the level of profits if all other fixed costs were underestimated by 30%.

Making the adjustment for the fixed costs reduces profits significantly in the earlier years and magnifies the increase in profits during the 1994-2006 period, from about \$50,000 per vessel in 1994 to \$300,000 per vessel in 2006 (Figure 17). The profit numbers do not include any adjustment of loan payments, however. One reason for this is that in general only interest paid on mortgage is counted as costs, whereas payments on principal increases the assets of vessel owners. The report did not have separate estimates for the average interest payments per vessel as separate from the principal payments. There is also no data on the number of owners that have still outstanding loans to pay on the vessels. According to the Georgianna study, loan payment averaged about \$37,000 per vessel (large scallopers) in 1997 prices, or \$46,300 if adjusted for inflation in 2006 prices. If this amount was deducted from profits, it would wipe out significant part of profits during the period 1994-1998 for those boat owners that are still paying for mortgage. There would be no change in the overall trends which shows a significant increase in profits during the period 1994-2007, however.

Figure 17. Average gross and adjusted profits per vessel for a sample of 124 full-time vessels.

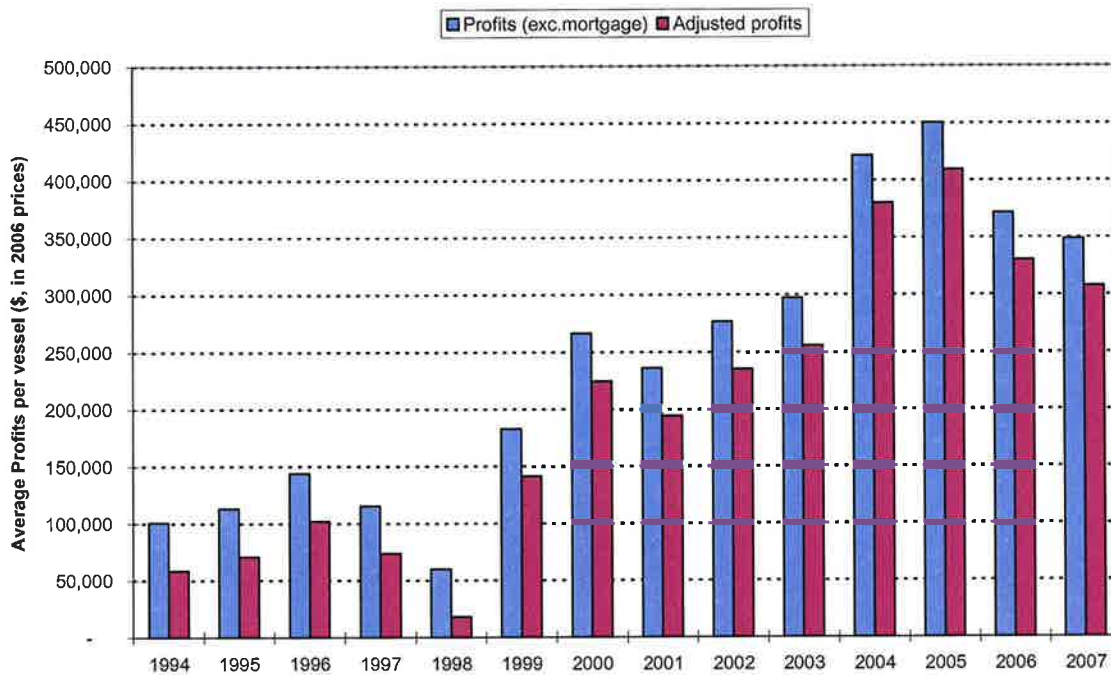
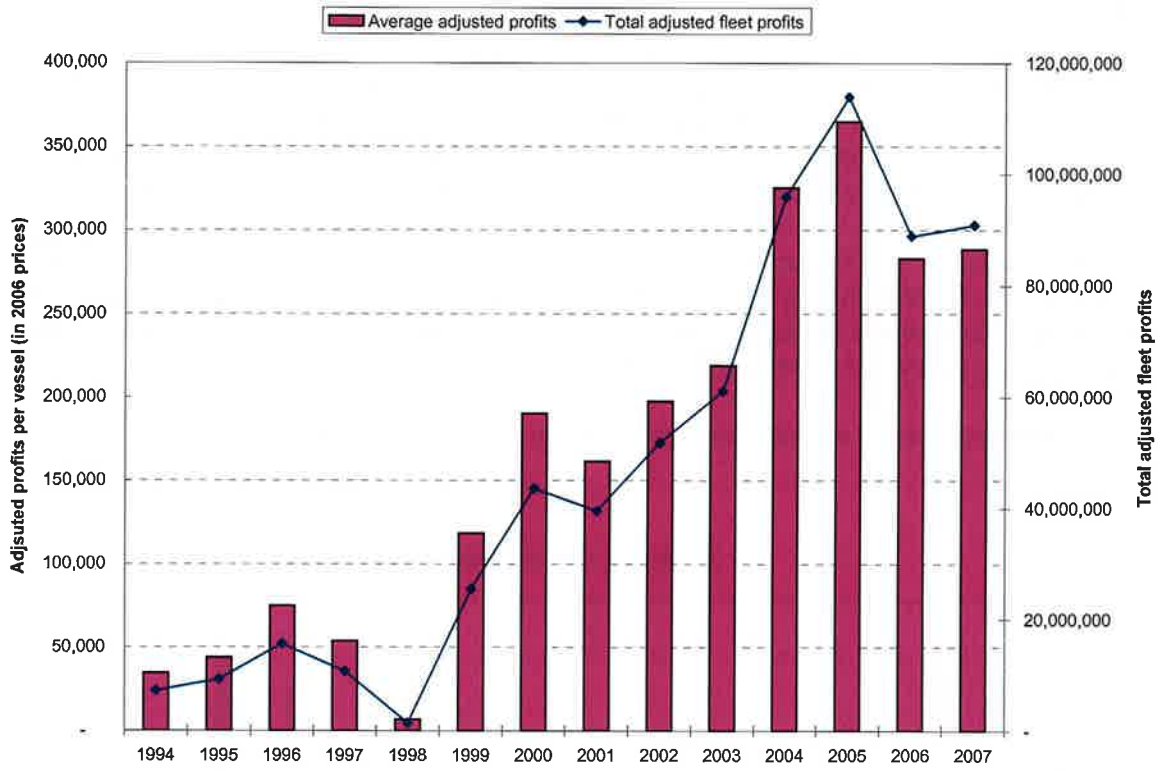
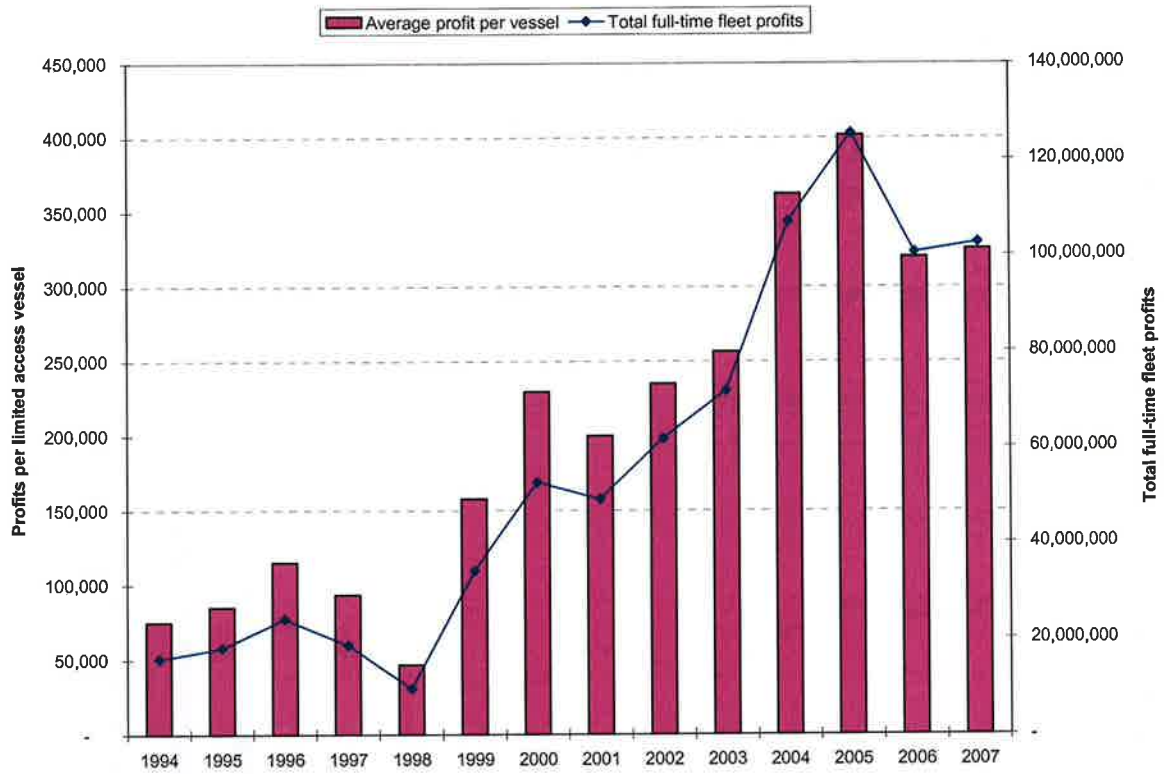


Figure 18. Average adjusted profits per full-time vessel and total full-time fleet profits (in 2006 prices)



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Figure 19. Average gross profits per full-time vessel and total full-time fleet profits (in 2006 prices)



TRENDS IN FOREIGN TRADE

1.6.3 Exports

Figure 20 shows exports from NE and Mid-At. Ports and includes fresh, frozen and processed scallops. The exports from all other states and areas totaled only about a 1 million in 2006 and 2007, thus was not significant.

Figure 20. Scallop exports from New England and Mid-Atlantic (by calendar year)

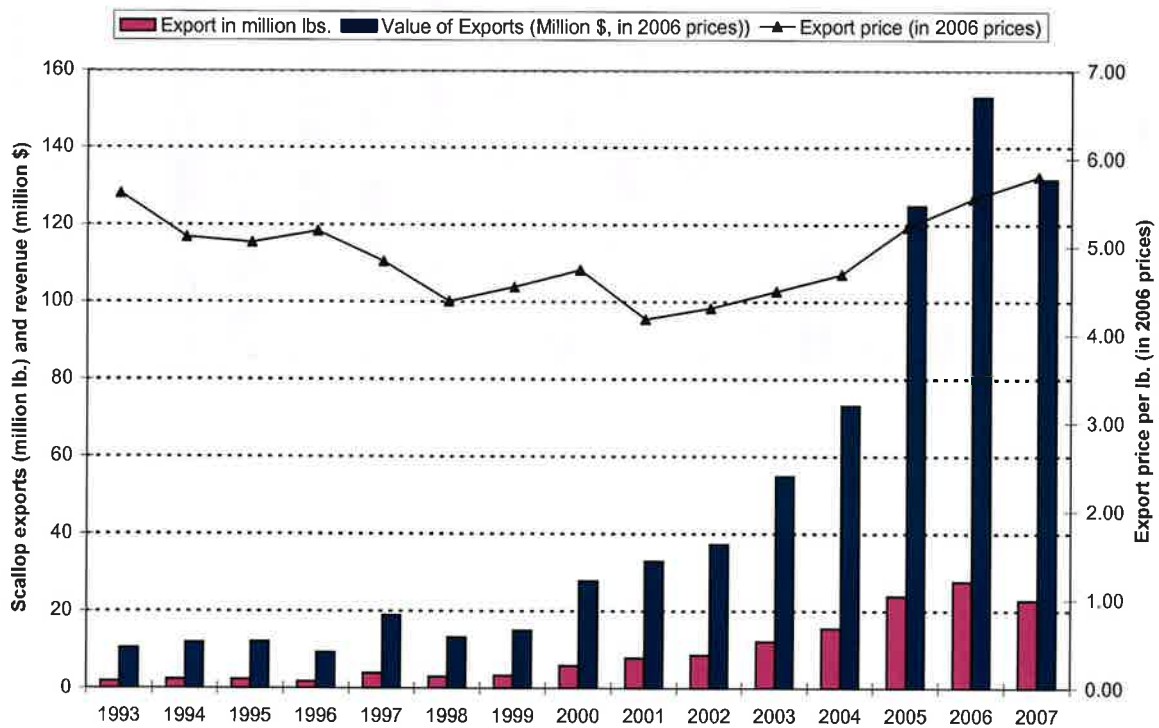


Figure 21. Value of exports by Region (\$ million, in 2006 prices)

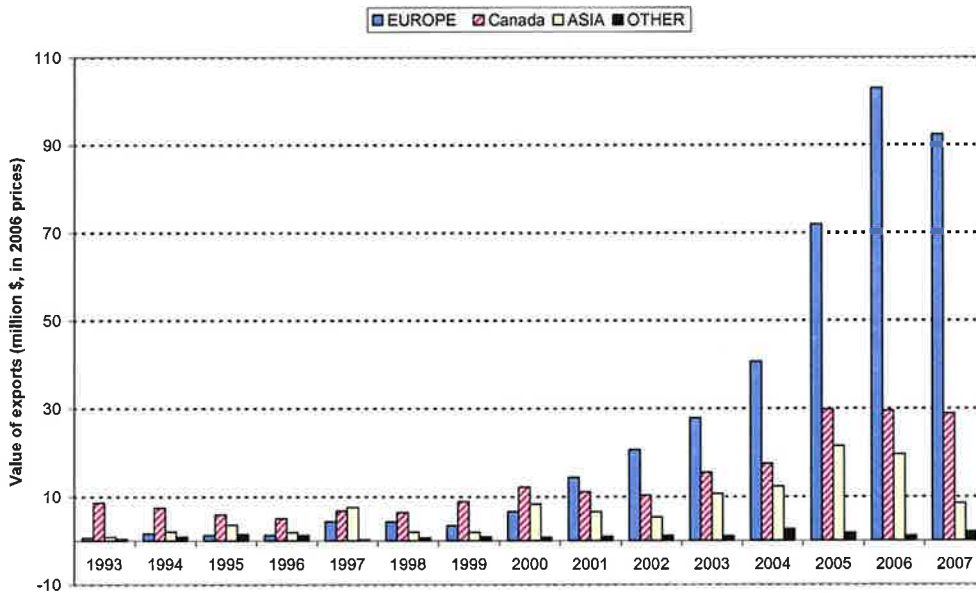
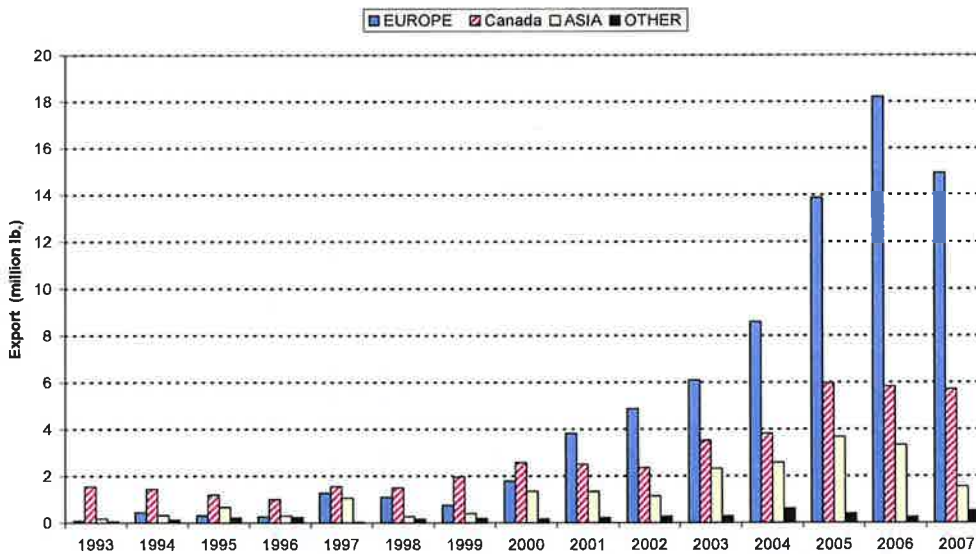


Figure 22. Exports by region



1.6.4 Imports

Figure 23. Imports, value of imports and import price of scallops (by calendar year)

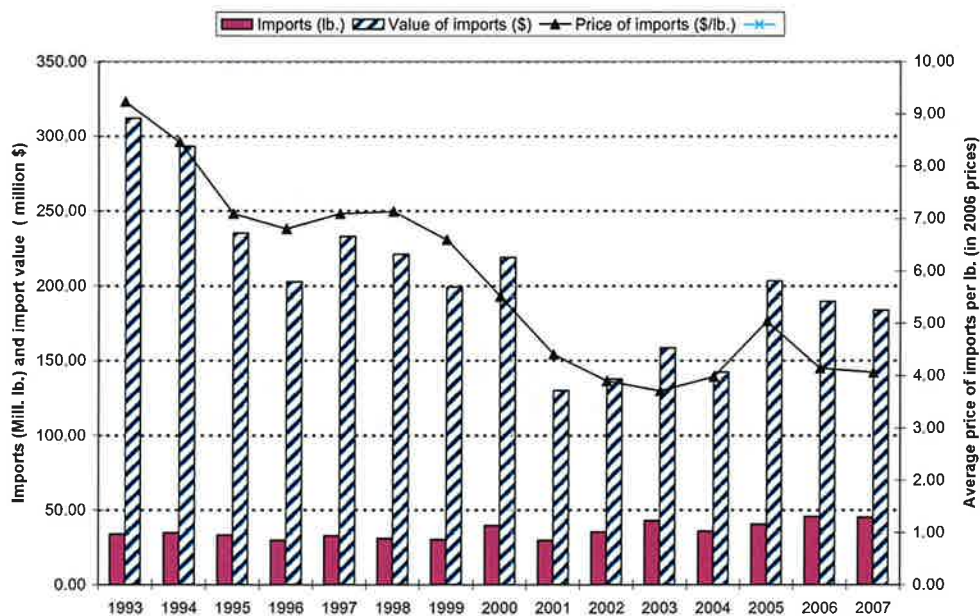


Figure 24. Scallop imports by New England and Mid-Atlantic States by country of origin

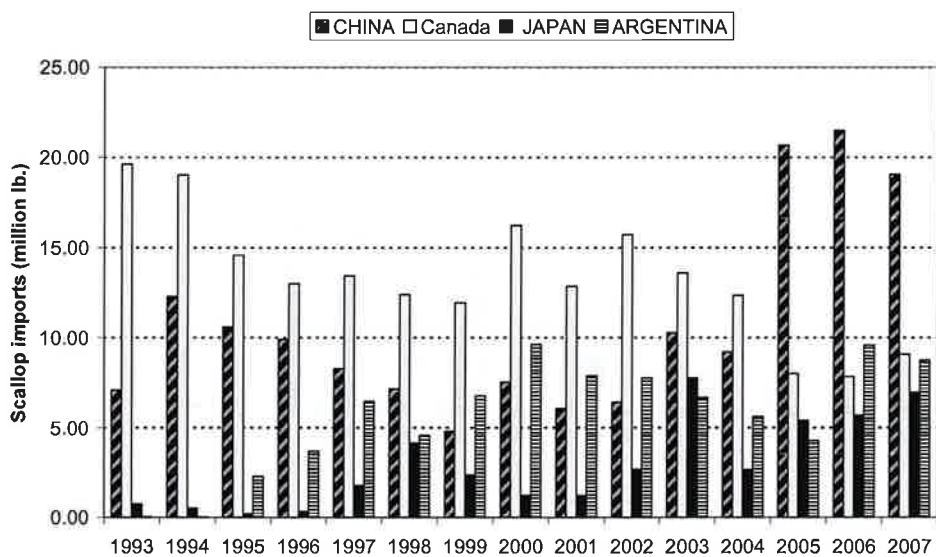


Figure 25. Import price per pound of scallops (in 2006 prices)

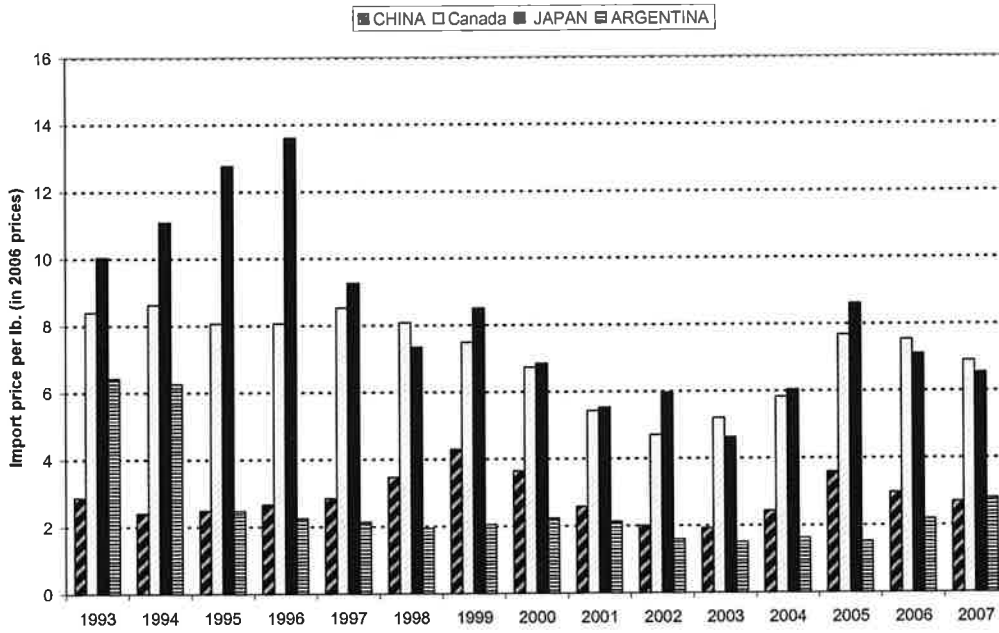
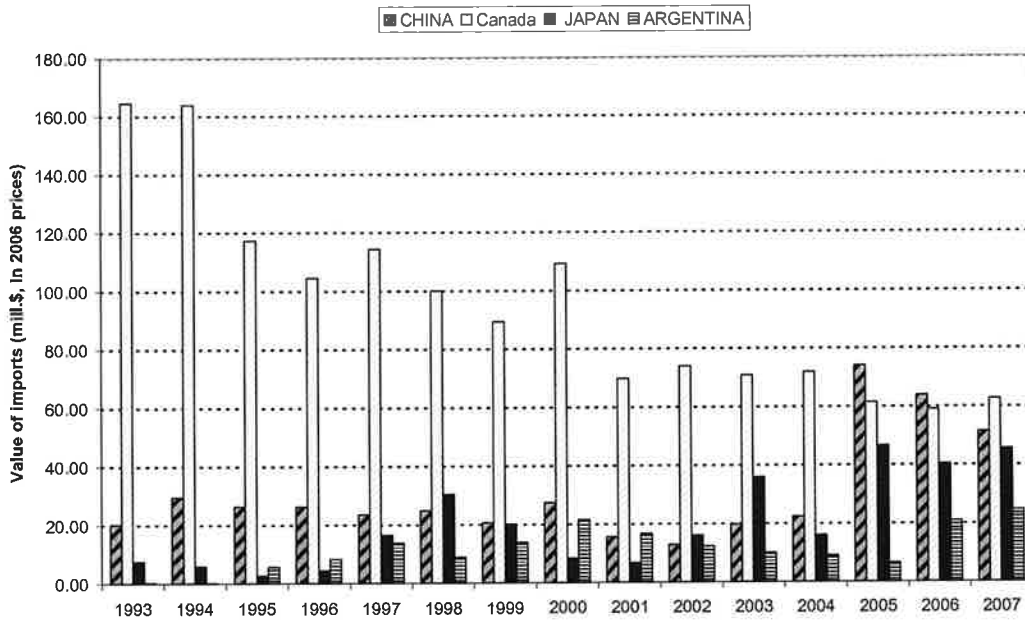


Figure 26. Value of imports by country of origin (\$ million, in 2006 prices)



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1.7 REFERENCES

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45th SAW Assessment Report, by Northeast Fisheries Science Center

National Marine Fisheries Serv., Woods Hole Lab., 166 Water St., Woods Hole, MA 02543

Print publication date September 2007; web version posted September 24, 2007

Citation: 45th Northeast Regional Stock Assessment Workshop (45th SAW): 45th SAW assessment report. US Department of Commerce, Northeast Fish Science Center Ref Doc 07-16; 370 p.

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