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THE ECONOMIC IMPACT OF THE SEA SCALLOP *Placopecten magellanicus* FISHERY IN VIRGINIA

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THE ECONOMIC IMPACT OF THE SEA SCALLOP

Placopecten magellanicus

FISHERY IN VIRGINIA

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INTRODUCTION

The sea scallop Placopecten magellanicus (Gmelin) is harvested over its entire range from the Gulf of St. Lawrence to Cape Hatteras, N. C. Since 1975, more than 60% of the total U. S. scallop harvest has been from the Middle Atlantic shelf (ICNAF, 1977). Sea scallop landings in Virginia have been largely cyclical with peaks during 1958-1961, 1965-1969, and 1975 to the present. Landings from 1975 to 1977 increased from 1.27 to 3.61 million pounds and ex-vessel value increased from 2.32 million to 5.49 million dollars, respectively. Present indications point to record landings in 1978 with a value that could exceed 20 million dollars.

The object of this survey was to assess the economic impact of the sea scallop fishery in Virginia during this period of record growth. Also, the survey provides for an economic analysis of Virginia based scallop vessels.

Description of Fishery and Data

During 1977 Virginia landings totaled 3.6 million pounds, representing a 22% increase over 1976 and 65% of the mid-Atlantic scallop landings. During the first half of 1978, Virginia landings equaled 89% of total 1977 landings. The number of scallop vessels landing in Virginia ports reached record levels in 1977 and 1978. At the end of June 1978 there were 35 scallop vessels, 24% of which were less than two years old. Average gross tonnage for vessels was 110 gt. The length of 85% of the vessels was between 70 and 90 feet.

In Table I, monthly data on Hampton Roads scallop landings for the period January 1977 to June 1978 are presented. During the first six months of 1978 there were 247 vessel trips compared to 74 for the same period during 1977. Pounds of scallops landed increased 279% during the first half of 1978 over the first half of 1977 while pounds landed per trip declined 17% from 14,400 to 12,000. However, ex-vessel prices rose from an average of \$1.53 per pound to \$2.04 resulting in an increase in the average value of landings per trip from \$22,000 to \$24,500.

Table I. Hampton Roads Scallop Landings, January 1977 - June 1978.

| Date | Scallop Dredge Vessels | | | | Scallop Trawl Vessels | | | |
|-------------|------------------------|-----------|---------------|------------------------|-----------------------|-----------|---------------|------------------------|
| | No. Vessels | No. Trips | Lbs. (1000's) | Lbs. Per Trip (1000's) | No. Vessels | No. Trips | Lbs. (1000's) | Lbs. Per Trip (1000's) |
| <u>1977</u> | | | | | | | | |
| Jan. | 5 | 9 | 56 | 11.2 | 0 | 0 | 0 | 0 |
| Feb. | 6 | 11 | 97 | 8.8 | 0 | 0 | 0 | 0 |
| March | 7 | 11 | 157 | 14.3 | 0 | 0 | 0 | 0 |
| April | 7 | 10 | 162 | 16.2 | 6 | 2 | 9 | 4.5 |
| May | 10 | 15 | 279 | 18.6 | 13 | 24 | 143 | 6.0 |
| June | 10 | 18 | 313 | 17.4 | 21 | 34 | 193 | 5.9 |
| July | 12 | 23 | 330 | 14.4 | 16 | 26 | 170 | 6.5 |
| Aug. | 14 | 23 | 285 | 12.4 | 8 | 17 | 148 | 8.7 |
| Sept. | 14 | 26 | 290 | 11.2 | 8 | 12 | 78 | 6.5 |
| Oct. | 15 | 32 | 338 | 10.6 | 3 | 5 | 29 | 5.8 |
| Nov. | 15 | 23 | 220 | 9.6 | 1 | 4 | 8 | 2.0 |
| Dec. | 14 | 24 | 185 | 7.7 | 0 | 0 | 0 | 0 |
| <u>1978</u> | | | | | | | | |
| Jan. | 17 | 36 | 180 | 5.0 | 0 | 0 | 0 | 0 |
| Feb. | 14 | 27 | 141 | 5.2 | 0 | 0 | 0 | 0 |
| March | 18 | 30 | 350 | 11.7 | 0 | 0 | 0 | 0 |
| April | 22 | 37 | 472 | 12.8 | 0 | 0 | 0 | 0 |
| May | 29 | 49 | 763 | 15.6 | 0 | 0 | 0 | 0 |
| June | 36 | 68 | 1062 | 15.6 | 3 | 4 | 21 | 5.3 |

Source: National Marine Fisheries Service, Hampton Virginia, Ms. L. Rogers.

METHODS

Data on crew shares, food, fuel, ice, chain bags, vessel expenses, personal expenses, and the value of the catch were obtained from settlement sheets of 12 scallop dredge vessels. Data on the expense of engine overhauls, hull maintenance, insurance and the market value of the vessels was obtained from surveys of the vessel owners. Interest expenses were computed at 10% of the value of the vessel. This expense was used to determine either the annual interest expense of a vessel mortgage or the opportunity of making some other investment equal to the value of the vessel yielding a 10% return.

The income multiplier for the Hampton-Newport News area was determined from data contained in Local Area Personal Income, 1970-75, U. S. Department of Commerce, Bureau of Economic Analysis, 1977. The income multiplier of 2.49 means that for every \$1.00 of income generated in the basic sector (e.g., paid to scallop vessel crews) another \$1.49 of income is generated in the service sector as the initial \$1.00 is spent.

FINDINGS

The total economic impact of the sea scallop fishery in Virginia consists of direct and indirect employment and income effects. Direct or basic sector effects include employment and income generated on vessels, on-shore, in processing, and in firms supplying goods and services to scallop vessels. Income generated on vessels includes the

captains' and crews' total shares, bonuses, and the ex-vessel value of the incidental catch. Indirect or service sector effects include retailing activity, income, and employment resulting from the spending of income earned in the basic sector.

For our sample of twelve vessels between 1 July 1977 and 1 July 1978, income generated on vessels averaged 55% of the value of scallops landed. The total value of scallops landed during this period was \$8,920,000 which resulted in \$4,906,000 of income generated on vessels. Based on surveys of the four scallop operators on the Hampton-Norfolk area, on-shore employment induced by the scallop fishery generated an additional \$1,202,000 in wages during the same period. Expenses and income generated at firms supplying goods and services to scallop vessels were computed using the data base developed for each of the 12 vessels included in this survey. These expenses (Table II) were based on the average number of vessels (18.3) operating in the fishery during 1 July 1977 - 1 July 1978. The total basic sector income for this period was \$6,484,000. Applying the income multiplier of 2.49, the combined income generated by the basic and secondary sectors was \$16,144,000.

The data in Tables II and III may be somewhat underestimated as shell-stocking activities were not included. Vessels shell-stocking scallops were sporadically active during this period and, in this study, are not considered a permanent component of the fishery.

Table II. Basic Sector Impact of Firms Supplying Goods and Services to Scallop Vessels, 1 July 1977 - 1 July 1978.

| Type of Good or Service | Total Annual Expenses | Income - Sales Ratio | Income Impact |
|-----------------------------------|-----------------------|----------------------|---------------|
| Petroleum Products | \$ 768,000 | .09 ^c | \$ 69,000 |
| Electrical & Electrical Suppliers | 199,000 | .33 ^c | 66,000 |
| Marine Service (engine & hull) | 519,000 | .28 ^b | 145,000 |
| Grocery Supplies | 379,000 | .09 ^c | 34,000 |
| Frozen Foods (ice) | 132,000 | .06 ^c | 8,000 |
| Marine Supplies & Repairs | 269,000 | .20 ^b | 54,000 |
| Total | \$2,266,000 | | \$376,000 |

a Includes cost of bags and ties, knives, gloves, rags, and other supplies and labor.

b Based on survey of Hampton Roads suppliers.

c Sources: Census of Wholesale Trade, 1972, Volume II, Area Statistics, and 1972 Census of Retail Trade, Vol. II, Area Statistics, Part 3, North Dakota - Wyoming; all volumes published by the U. S. Department of Commerce.

Table III. Income Generated by the Sea Scallop Fishery in Virginia, 1 July 1977 to 1 July 1978

| Basic Sector Income Components | Basic Sector Income | Service Sector Income | Basic Sector Plus Service Sector Income | Induced Income Factor |
|--------------------------------|---------------------|-----------------------|---|-----------------------|
| On vessels | \$4,906,000 | \$7,310,000 | \$12,216,000 | \$1.37 |
| On shore and in processing | 1,202,000 | 1,790,000 | 2,992,000 | |
| At suppliers | 376,000 | 560,000 | 936,000 | .85 |
| Total | \$6,484,000 | \$9,661,000 | \$16,145,000 | |

The average full time equivalent employment in the basic sector for the Hampton-Norfolk area during 1 July 1977-1 July 1978 was 388 and consisted of the following components: on-vessel 212, on-shore and processing 135, firms supplying goods and services 41. Service sector employment of 1215 was calculated as service sector generated income (\$9,661,000) divided by the average annual wage (\$8150) in the service sector.

Induced income factors were computed assuming that the total income resulting from on-vessel earnings (\$12,216,000 in Table III) is proportional to the ex-vessel value of landings. Thus a ratio of 1.37 was obtained, or \$1.37 of total income generated per \$1.00 of scallops landed. Total income generated on shore, in processing, and at suppliers was assumed proportional to the quantity of landings. Thus a ratio of 0.85 was obtained, or \$.85 of income per pound of scallops landed.

To summarize the total impact of the sea scallop fishery in Virginia, the income and employment effects in the Hampton Roads area were combined with effects of landings on Virginia's Eastern Shore (Table IV). Since these landings equaled 9% of Hampton Roads landings for the period 1 July 1977 to 1 July 1978, our Hampton Roads estimates were increased by that percentage to obtain the totals for Virginia.

Table IV. Income and Employment Generated by Hampton Roads and Virginia Eastern Shore Scallop Landings Combined.

| | 1 July 1977 to 1 July 1978 |
|------------------|----------------------------------|
| Total Income | \$17,598,000 |
| Total Employment | 1747 |

Analysis of Cost and Return of Virginia Scallop Vessels

The analysis of cost and return of Virginia scallop vessels for the period 1 July 1977 to 1 July 1978 was based on data for 12 vessels. Six of the vessels were less than five years old, three were between five and fifteen years, and three were between fifteen and thirty years.

Age was utilized as a basis for classification in Table V since it was the factor that most strongly influenced total cost. Vessel expenses and hull and engine maintenance (representing drydocking and overhauling expenses) rose and interest costs fell as age increased. The average total cost of operating a vessel in the 0-5 age class was \$578,100. In the 6-15 and 16-30 age classes average total costs were \$506,600 and \$506,900, respectively. These approximately equal costs are explained by movements in total cost components in opposite directions.

Net return, equal to the differences between value of landings (total revenue) and total cost in Table V was found to be highest for the newest vessels. Net return equals economic profit (before taxes). If a vessel is fully owned (without a loan) accounting profit would also include the opportunity cost of investing the market value of the boat in its best alternative investment, here assumed to be one with a 10% accounting profit rate. The higher net return in the 6-15 year class over the 16-30 year class was attributed to a larger number of trips since the total costs in these two age classes differed only

slightly. The number of trips for vessels in each class can be considered a maximum since weather conditions during the period 1 July 1977 to 1 July 1978 were quite favorable to the fishery.

Table V. Budgetary Analysis of Virginia Scallop Vessels, 1 July 1977 - 1 July 1978.

| Average Annual Cost and Return | Age of Vessels | | |
|---|------------------|-------------------|--------------------|
| | 0-5 Years N=6 | 6-15 Years N=3 | 16-30 Years N=3 |
| Crew Share | \$384,400 | \$329,300 | \$323,600 |
| Crew Expense (food, fuel, lube oil, grease, chain bags, personal expenses) | 67,200 | 69,500 | 67,500 |
| Ice | 6,000 | 5,500 | 13,400 |
| Vessel Expense (welding, minor repairs) | 19,100 | 21,700 | 27,900 |
| Hull & Engine | 23,900 | 25,300 | 28,100 |
| Insurance | 24,600 | 22,700 | 19,500 |
| Interest | 48,000 | 28,000 | 22,500 |
| Other | 4,900 | 4,600 | 4,400 |
| Total Costs | 578,100 | 506,600 | 506,900 |
| Value of Landings (total revenue) | 689,000 | 591,000 | 567,700 |
| Net Return | 110,900 | 84,400 | 60,800 |
| Trips/Year | 24 | 23 | 22 |

Break-even levels of annual revenue were calculated for each vessel age class by assuming that crew share in Table V remains a constant fraction of the value of landings and that other expenses per

vessel remain at levels consistent with 1977-78 effort. In Table VI, break-even levels of total revenue for each vessel category are presented. Vessels in the 0-5 year age class had the highest break-even points, reflecting the relatively large amounts of capital invested in these boats. Vessels in the 16-30 year age class had break-even points in the middle range, reflecting the combination of higher operating costs and lower maximum number of trips per year. The calculated break-even levels of revenue represent those levels necessary to hold profit maximizing vessels in the scallop fishery. It is assumed that when the break-even point is reached, vessel owners have the option of selling their boats and earning a 10% rate of return on alternative investments or converting their vessels to participate in another fishery. Thus the break-even point is affected by the vessel's market value, which is a reflection of the discounted present value of returns over cost in its highest return fishery.

Table VI. Break-even Levels Based on Value of Landings (Total Revenue).

| | Age of Vessels | | |
|---|----------------|------------|-------------|
| | 0-5 years | 6-15 Years | 16-30 Years |
| Break-even Total Revenue | \$438,235 | \$400,226 | \$426,279 |
| 7/1/77 - 7/1/78 Total Revenue | \$689,000 | \$591,000 | \$567,700 |
| Break-even Level as a Percent of 7/1/77-7/1/78 Revenues | 64% | 68% | 75% |

The effect of alternative price and abundance conditions (expressed as total revenue as a percent of 1977-78 revenue) on net return was examined (Figure 1). It was found that vessels in the 0-5 year age category had higher net return, not only at the 1977-78 levels of total revenue reported in Table VI, but at all total revenue levels. The exception was that vessels in age classes 0-5 years and 6-15 years would have equivalent losses operating at or below 52% of the total revenue as a percent of 1977-78 revenue. Vessels in 0-5 year age class can continue to operate profitably under price and abundance conditions that result in losses for vessels in the other age classes. These results support the vessel operator interview evidence of McHugh and Mirchel (1978)¹ who found that investors in new vessels felt they would fare relatively well during years of low abundance or price.

Vessels in all age groups were found to operate profitably as long as price and abundance levels are sufficient to generate annual value of landings per vessel equal to 75% of the 1977-78 level. Since the average ex-vessel price during that period was \$1.98 per pound, if price fell to \$1.49 all vessels could break-even at 1977-78 abundance and catch levels. Likewise, all vessels could continue to break even if price averaged \$1.98 and landings per trip declined by 25%. The

¹ McHugh, J. L. and C. F. Mirchel. 1978. Study of the economic structure of the Mid-Atlantic sea scallop industry. Draft Report to the New England Regional Fishery Management Council.

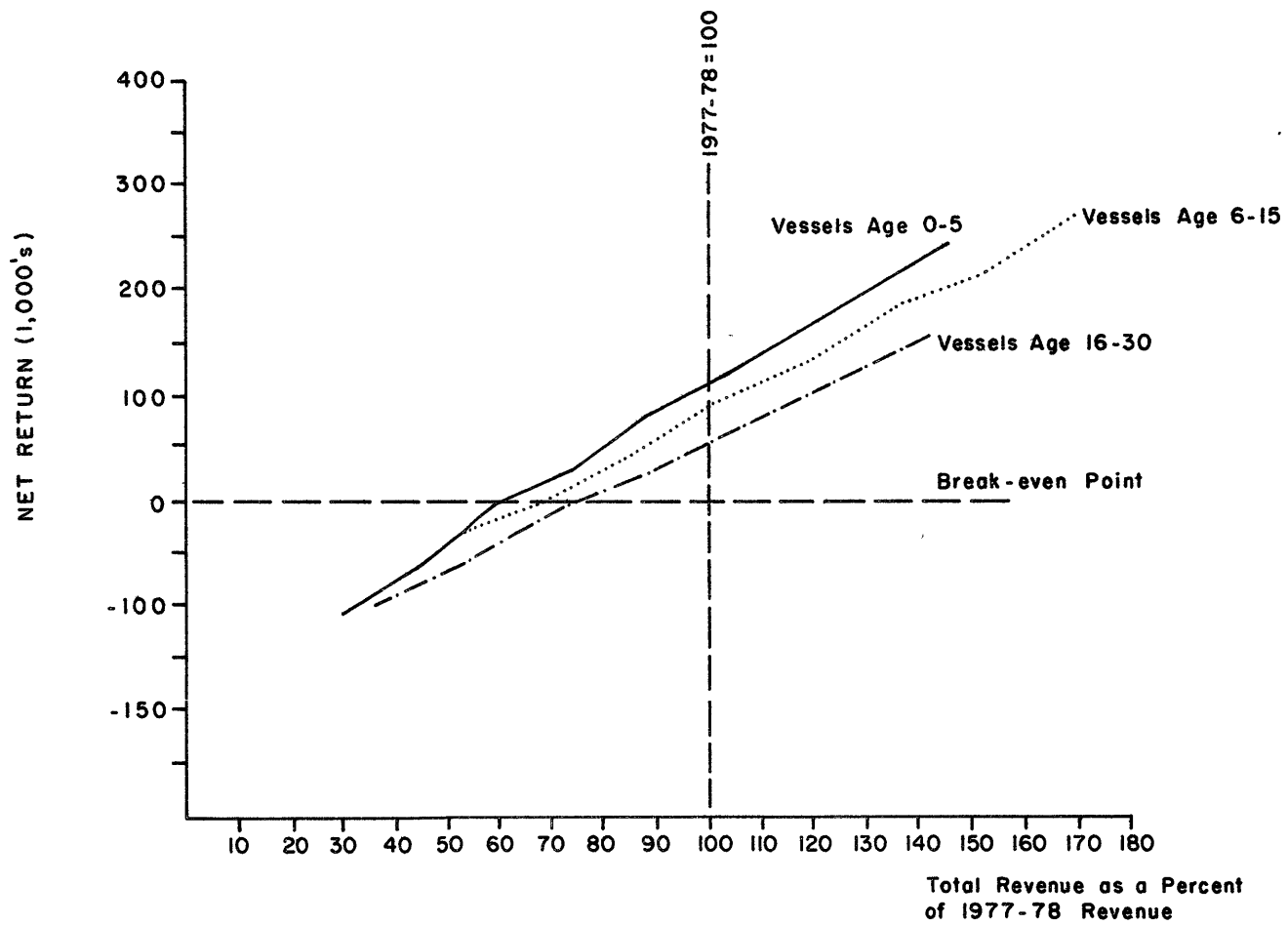


Figure 1. Net return and break-even point of sea scallop fishing vessels grouped by age. Estimate is based on total revenue as a percent of 1977-78 revenue.

actual range price and abundance conditions over which vessels in different age classes begin to operate unprofitably was found to be quite narrow. Break-even levels of total revenue for all vessels occurred between value of landings equal to 64% and 75% of 1977-78 value of landings.

Although it was found that the newer the vessel the lower the break-even level of total revenue, the question of whether old or new vessels will tend to remain in the scallop fishery during a period of decreased abundance depends on the alternatives that vessel owners have.

Projected Impact July 1, 1978 - July 1, 1979

It is difficult to assess the economic impact of the sea scallop industry beyond 1979 due to the uncertain state of the scallop stocks (Serchuck, Wood and Brown 1977²; NMFS Stock Assessments, 1978³) and the unrealistic assumption that the annual rate of growth of the fishery for 1977-78 will continue for 1978-79. However, July and August 1978 landing data (Table VII) can provide the basis for some

² NMFS. 1978. Summary of stock assessments. National Marine Fisheries Service, Woods Hole Laboratory. Laboratory Reference No. 78-40.

³ Serchuck, F. M., P. Wood and B. E. Brown. 1977. Comparison of Mid-Atlantic sea scallop length-frequency distributions between 1977 and 1975 as determined from research vessel surveys and commercial landings. National Marine Fisheries Service, Woods Hole Laboratory. Laboratory Reference No. 77-27.

short term projections. For the comparable period in 1977, July-August 1978 landings were up by 1,030,700 pounds or a 201% increase, and value of catch increased by over 350%. It may be unrealistic to apply this same rate of increase to the projections for 1978-79. If the more conservative assumption is made that the average monthly landings would approximate 800,000 pounds with an ex-vessel value of \$2.50/lb., some estimates of the economic impact can be made (Table VIII). On an annual basis, 9,600,000 pounds would be landed at a value of \$24,000,000.

Table VII. Vessel activity and value of sea scallops landed in Virginia, July, August 1978.

| | lbs. Landed | No. Vessels | No. Trips | lbs./Trip | Revenue/Trip | Average Price/lb. | Value |
|-----------|----------------|----------------|--------------|-----------|--------------|----------------------|-----------|
| July 1978 | 996,551 | 53 | 89 | 11,197 | 27,853 | 2.51 | 2,501,895 |
| Aug. 1978 | 967,158 | 50 | 87 | 11,116 | 26,234 | 2.36 | 2,287,022 |

Table VIII. Projected income generated by the sea scallop fishery in Virginia, 1 July 1978 - 1 July 1979.

| Income Components | Basic Sector Income | Service Sector Income | Basic Sector Plus Service Sector Income |
|----------------------|------------------------|--------------------------|--|
| on vessel | \$13,200,000 | \$19,680,000 | \$32,880,000 |
| on shore processing | 2,400,000 | 3,576,000 | 5,976,000 |
| at suppliers | 768,000 | 1,444,000 | 1,912,000 |
| Total | \$16,368,000 | \$24,400,000 | \$40,768,000 |

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