Penn State Environmental Law Review

Volume 5 | Number 2 Article 3

6-1-1996

Individually Transferable Quotas and the Magnuson Act: Creating Economic Efficiency in Our Nation's Fisheries

Ransom E. Davis

Individually Transferable Quotas And The Magnuson Act: Creating Economic Efficiency In Our Nation's Fisheries

Ransom E. Davis[*]

I. Introduction

The severe depletion of fish stocks throughout United States fisheries[1] inspired Congress to pass the Magnuson Fishery Conservation and Magnuson Act[2] (Magnuson Act) in 1976 to preserve fish stocks and to revitalize the ailing fishing industry.[3] Unfortunately, twenty years after passage of the Magnuson Act, fisheries exhibit the same characteristics of diminished fish stocks and excessive capital and labor investment by fishers in exhausted fisheries.[4] Economists identify the common property nature of fisheries as the root cause of the chronic depletion of the resource.[5] Because fishers possess no property rights in unharvested fish, the free market drives them to augment capital and fishing effort in a race against

---

* Ransom E. Davis, Esq. graduated from the Dickinson School of Law in May 1995 and holds a B.A. in Economics and in Spanish from Franklin & Marshall College. He currently clerks for President Judge William L. Henry in the Court of Common Pleas of Jefferson County, Pennsylvania.

[1] The Magnuson Act defines fisheries as "one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics." 16 U.S.C. § 1802(8)(A). The term fishery also includes "any fishing for such stocks." § 1802(8)(B).

[2] 16 U.S.C. § 1801-1882 (1976). The official title of the Act was changed in 1982 to The Magnuson Fishery Conservation and Management Act. Pub. L. No. 96-561, § 238, 94 Stat. 3296 (amending 16 U.S.C. § 1801 (1982)).

[3] § 1801(b).

[4] Carrie Tipton, *Protecting Tomorrow's Harvest: Developing a National System of Individual Transferable Quotas to Conserve Ocean Resources*, 14 VA. ENVTL. L.J. 381, 383 (1995). The declining productivity of fisheries is not limited to the United States. The collapse of the Peruvian anchovy fishery in 1972 from 10.5 million tons to 4.7 million tons gives an example of international depletion of fishery resources. Open access to fisheries worldwide has led to a pattern of excessive exploitation, dissipation of economic rent, losses in employment, overcapitalization, decline in average yields of fish, and increased risk of stock collapse. Jean-Paul Troadec, *The Mutation of World Fisheries: Its Effects on Management Priorities and Practices in* MANAGEMENT OF WORLD FISHERIES: IMPLICATIONS OF EXTENDED COASTAL STATE JURISDICTION 2 (1989); Joshua John, *Managing Redundancy In Over-Exploited Fisheries*, *in* WORLD BANK DISCUSSION PAPERS NO. 240, FISHERIES SERIES v, viii (World Bank 1994).

[5] TOM TIETENBERG, ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS 312 (3d ed. 1992).

competitors to harvest fish as quickly as possible.[6] Any fisher who attempts to conserve fishery resources by leaving some fish behind to reproduce will lose them to competitors.[7] While competition in the free market drives most economic industries to produce an optimum quantity of goods at low prices, competition in the commonly owned fisheries induces fishers to employ artificially high levels of capital and fishing effort, thus reducing fish stocks and causing consumer prices to rise.[8]

Current regulations under the Magnuson Act fail to prevent overfishing because they fail to change the basic common property nature of fisheries.[9] The effort restrictions regulators presently employ, including limited entry, shortened seasons, and technological restrictions, do not address the lack of property rights in fish resources and they have uniformly failed to revive exhausted fish stocks.[10] A new fishery management tool entitled the individually transferable quota (ITQ) defeats the common property problem by assigning to each ITQ holder a defined quantity of harvestable fish.[11] Because each fisher is assured of a specific quantity of fish in an ITQ management regime, the drive to employ excess capital and effort to fully deplete a fishery is curtailed.[12] The ITQ thereby empowers fishery managers enforcing the Magnuson Act to stabilize fish stocks and to strengthen the fishing industry.

Part I of this Article will describe the peculiar nature of fisheries as a common resource with particular emphasis on the existing economic inefficiency. Part II of this Article will explore the genesis of federal regulation of fisheries through an examination of the specific provisions of the Magnuson Act. Part III will critique the Act's effectiveness in achieving its enunciated objectives. Finally, Part IV of this Article will fully examine the ITQ as the economic solution to the common resource dilemma.

---

[6] Tipton, *supra* note 4, at 382.

[7] *Id.*

[8] Ragnar Arnason, *Theoretical and Practical Fishery Management*, *in* MANAGING FISHERY RESOURCES: WORLD BANK DISCUSSION PAPERS NO. 217, FISHERIES SERIES 3,7 (Eduardo A. Loayza ed., World Bank 1994). *See also* Tipton, *supra* note 4, at 383.

[9] DAVID E. PIERCE & PATRICIA E. HUGHES, NATIONAL OCEANIC AND ATMOSPHERIC ADMIN., U.S. DEP'T OF COMMERCE, INSIGHT INTO THE METHODOLOGY AND LOGIC BEHIND NATIONAL MARINE FISHERIES SERVICE STOCK ASSESSMENT 77 (1979).

[10] *Id.*

[11] STEPHEN CUNNINGHAM, ET AL., FISHERIES ECONOMICS: AN INTRODUCTION 147, 169 (1985).

[12] Arnason, *supra* note 8, at 7.

II. Fisheries as a Common Resource

Economists define fisheries as a common resource,[13] meaning that fishers do not possess individual property rights in fish before they are caught.[14] Because property rights are undefined, the market cannot efficiently[15] allocate fisheries resources.[16] As a result of market failure, fish stocks become depleted in the commonly owned fishery.[17] Additionally, the commonly owned fishery is characterized by meager profits and a diminishing supply of fish products for consumers.[18] Because fisheries lack private property rights, economic inefficiency pervades the fishing industry.[19]

As an illustration of a privately owned fishery, consider a fisher who creates a lake and owns all the fish within its waters. Although this person will catch some fish to sell the first year, he or she will leave behind enough to reproduce and fill the lake for the following year. By leaving some fish in this privately owned lake, the fisher maximizes profit over the long term.

Contrast this lake with a body of water such as the Chesapeake Bay. Because it is a commonly owned resource, no single person owns the water or the life contained within. On the contrary, tens of thousands of people fish in the Chesapeake Bay each year. Each fisher has an incentive to catch as many fish as technology allows. Fish that a fisher leaves for tomorrow will likely be caught by competitors today. The fisher, therefore, has no incentive to conserve. By maximizing personal profit, each fisher

---

[13] TIETENBERG, *supra* note 5, at 304-5.

[14] *Id.* at 312.

[15] Efficiency is commonly defined as minimizing expense. Here, the economic definition refers to a natural market condition where demand and supply are equal, markets clear, producers maximize profits, households maximize utility, and labor and capital markets achieve equilibrium. Also, reallocation of production or household income cannot be made without causing a net detriment to society. *See* JOHANSSON, AN INTRODUCTION TO MODERN WELFARE ECONOMICS 15-21 (1991) (discussing pareto optimal efficiency).

Fisheries are not efficient in an economic sense because too much capital and labor is invested in the fishing industry. Redistribution of capital and labor to other markets would result in a net benefit to society. Additionally, fisheries are overharvested, causing artificially low profits for fishers, diminished quantities of fishery products for consumers, and artificially high market prices. ROWENA M. LAWSON, ECONOMICS OF FISHERIES DEVELOPMENT 32, 39 (1984).

[16] TIETENBERG, *supra* note 5, at 312-13.

[17] Robert A. Siegel, *Federal Regulatory Policy for Marine Fisheries*, *in* ECONOMIC ANALYSIS FOR FISHERIES MANAGEMENT PLANS 28 (Lee G. Anderson ed., 1981).

[18] Tipton, *supra* note 4, at 382-83.

[19] Eduardo A. Loayza, *A Strategy For Fisheries Development*, *in* WORLD BANK DISCUSSION PAPERS NO. 134, FISHERIES SERIES 4 (World Bank 1992).

disregards the consequences to others and to the continued viability of the fishery.[20] As a result, fishers in privately owned fisheries overharvest the resource and invest excessive capital and labor into the fishing industry.[21]

Part I of this Article will further contrast the private fishery against the commonly owned fishery. Section A will introduce the reader to a biological fishery model and the concept of sustainable yields. Section B will display the economic model of a privately owned fishery, while Section C will depict the commonly owned fishery model. Section D will provide the reader with empirical data that support the theoretical predictions of Sections A, B, and C. This economic information is vital to obtain a complete legal understanding of fisheries. Fishery laws cannot be made or studied in a vacuum. Ultimately, intelligent fishery laws must be based on a thorough understanding of biology, economics, and law.

A. *Biological Fishery Model & Sustainable Yield*

Economists define fisheries as a renewable resource because they can provide fishers with a continuous supply of fish products when properly managed.[22] When fisheries are managed poorly, however, fish stocks diminish in size and future generations of fishers lose the benefits of the resource.[23] Fishery laws should therefore promote a fish harvest that can be sustained each year without reducing the size of the fish population. This level of fish harvest is referred to as a sustainable yield.[24] A sustainable harvest equals the growth rate of the fish population, so that the size of the fish population remains constant.[25] The maximum sustainable yield (MSY) represents the greatest number of fish that can be harvested each year without diminishing the size of the fish population.[26] Congress has defined the MSY as "the safe upper limit of harvest which can be taken consistently year after year without diminishing the stock so that the stock is truly inexhaustible and perpetually renewable."[27] The

[20] Tipton, *supra* note 4, at 382-83.

[21] John, *supra* note 4, at 4-5.

[22] Richard S. Johnston, *Fisheries Development, Fisheries Management, and Externalities*, WORLD BANK DISCUSSION PAPERS NO. 165, FISHERIES SERIES 3 (World Bank 1992).

[23] *Id.* at 6.

[24] ROWENA M. LAWSON, ECONOMICS OF FISHERIES DEVELOPMENT 269 (1984).

[25] *Id.*

[26] D.H. CUSHING, FISHERIES BIOLOGY, A STUDY IN POPULATION DYNAMICS 199 (2d. ed. 1981).

[27] H.R. REP. NO. 94-445, 94th Cong., 1st Sess. 47 (1975).

MSY occurs at the fish population level that produces the greatest growth in fish stock.[28]

A graphical representation of fish population and growth facilitates a better understanding of the dynamics of fish biology. Figure 1 depicts a biological model for fisheries originally developed by Milner B. Schaefer.[29] The vertical axis depicts growth in fish stock and the horizontal axis represents total stock of fish. From S^o to S^*, population growth increases as the fish stock increases.[30] From S^* to S^e, the rate of growth in fish stock decreases, but the total fish stock continues to increase.[31] Eventually, the point S^e is reached where no further growth occurs in fish stock.[32]

---

[28] Lawson, *supra* note 24, at 269-70.

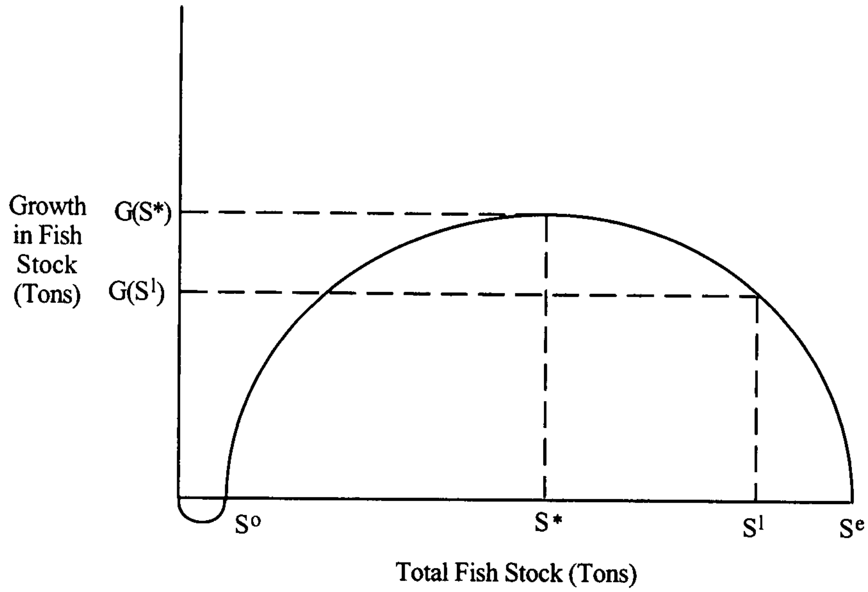
[29] Milner B. Schaefer, *Some Considerations of Population Dynamics and Economics in Relation to the Management of Marine Fisheries*, 14 J. FISHERIES RES. BOARD OF CAN. 669-81 (1957).

[30] CUNNINGHAM, *supra* note 11, at 27-30.

[31] *Id.*

[32] *Id.*

Figure 1
Fish Population and Growth



The fish stock which produces the largest growth in fish population is S^*. At this point, the maximum sustainable yield can be harvested.

S^e is called the natural equilibrium because population levels grow to this point in the absence of human pressure.[33] At fish population levels beyond S^e, too many fish exist for the available food supply, so that fish mortality or migration return the population to the natural equilibrium.[34] S^0 represents the minimum viable population because any level of population below this point results in decreasing levels of fish stock. Deaths and migrations exceed the reproduction rate and the fishery dwindles to extinction.[35] Each population level corresponds to a different sustainable yield. At fish population S^1, for example, the growth in fish stock will be $G(S^1)$. Individuals may harvest fish in the amount of $G(S^1)$ without any danger of diminishing the fish population.[36]

The fish population at point S^* produces the largest growth in fish stock and represents the MSY.[37] At this level of population, the fish stock reproduces at its highest rate and the largest number of fish may be harvested each year indefinitely.[38] While fishers could harvest fish in excess of the MSY in the short run, fish stocks would decline over the long term, leading to diminished future sustainable yields.[39]

B. The Privately Owned Fishery Model

Economic incentives normally drive fishers in a privately owned fishery to harvest a sustainable yield.[40] By doing so, the private fisher maximizes profit over the long term by assuring himself or herself of a perpetual supply of fish products.[41] The specific quantity of fish harvested will depend on several variables. Chiefly, the cost of fishing, the size of the fish

---

[33] TIETENBERG, *supra* note 5, at 305.

[34] CUNNINGHAM, *supra* note 11, at 27-30.

[35] *Id.*

[36] LAWSON, *supra* note 24, at 34-35.

[37] CUSHING, *supra* note 26, at 199.

[38] LAWSON *supra* note 24, at 34.

[39] CUSHING, *supra* note 26, at 199.

[40] TIETENBERG, *supra* note 5, at 309-11.

[41] Private property rights for shellfish are easily assignable because, unlike more mobile fish, they stay in place when they are planted. An area of ocean floor can be assigned to an individual who will plant and harvest the shellfish. Actions in trespass and conversion have been maintained against intruding fishers. *See* Sequim Bay Canning Co. v. Bugge, 49 Wash. 127, 94 P. 922 (1908). When shellfish are privately owned, the economic inefficiency characteristic of common property fisheries disappears. Johnston, *supra* note 22, at 19. Empirical data show that in states where shellfish are privately owned, including Virginia and Louisiana, the sustainable harvests are greater, fishers' incomes are larger, and prices for consumers are lower than in states where shellfish are commonly owned, including the states of Maryland and Mississippi. TIETENBERG, *supra* note 5, at 314.

population, and the price of fish determine the quantity of fish harvested.[42]

Figure 2 presents the analytical framework for the privately owned fishery.[43] It depicts the benefits and costs of fishing as a function of the quantity of fishing effort employed. The vertical axis is a dollar measure of the benefits and the costs of fishing effort. The horizontal axis measures the quantity of fishing effort used.[44] From this framework, a benefit curve is derived.

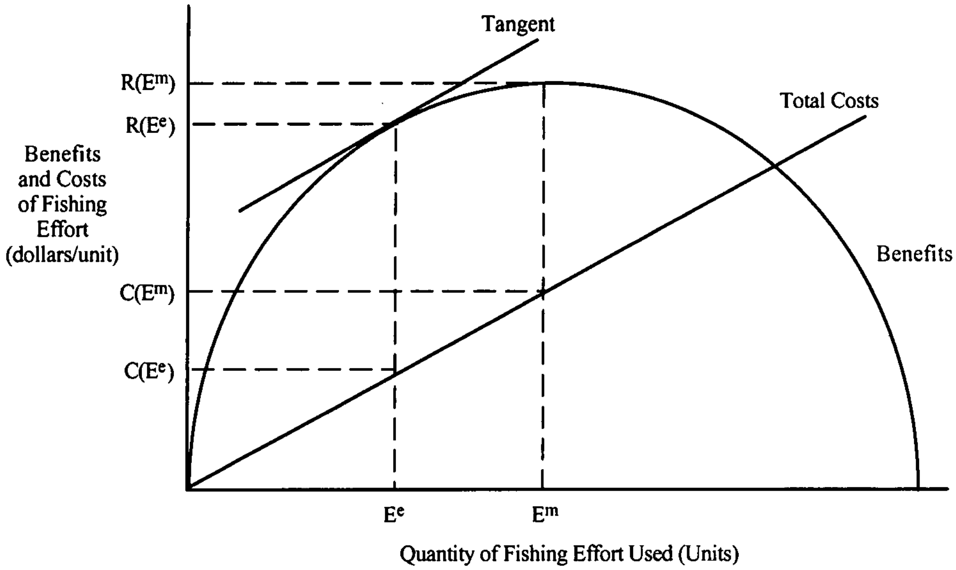
---

[42] CUNNINGHAM, *supra* note 11, at 16-20.

[43] For an in-depth analysis of fishery management, from which these less complex models are derived, see THE ECONOMICS OF FISHERIES MANAGEMENT (Lee G. Anderson ed., 1986).

[44] Units of fishing effort are measured as tons of fishing vessels employed in the fishery. Sometimes, however, fishing effort is measured in vessel hours or vessel years. CUNNINGHAM, *supra* note 11, at 30.

Figure 2
Static-Efficient Sustained Yield



The fishers in privately owned fisheries will augment fishing effort until the marginal cost of fishing equals the marginal revenue of fishing and profit is maximized. This economically efficient solution is represented by point E^e on the graph.

The benefit curve rises initially as additional units of fishing effort cause fishing profits to rise.[45] As fishers augment effort, they catch more fish, driving up revenue. Eventually, however, revenue plateaus at a point represented by E^m, where further fishing effort decreases the sustainable catch, causing revenue to decline in subsequent years.[46] The total benefit curve slopes downward beyond this point.[47] E^m corresponds to the MSY on Figure 1. There, the fisher catches the largest number of fish that can be harvested on a perpetual basis and maximizes the benefits of fishing.[48]

The total cost curve measures the costs of additional units of fishing effort.[49] This curve rises because labor costs increase as the fisher employs additional vessel hours.[50] Furthermore, vessel deterioration and wear of nets and equipment push costs up as vessel hours rise.[51] The total cost and total benefit curves represent the static-efficient sustained yield for the private fishery. It is "static" because the model assumes that interest rates are zero.[52] Also, it assumes that the price of fish is constant, the marginal cost of a unit of fishing effort is constant, and the quantity of fish harvested per unit of effort is proportional to the size of the fish population. These assumptions make the model more manageable while not fundamentally changing the analysis.[53]

The rational fisher in a privately owned fishery will use a quantity of fishing effort equal to E^e.[54] Common sense might suggest that in the idealized fishery, the MSY would be harvested each year. In this case, common sense is misleading. A rational fisher will have to evaluate the cost of harvesting the fish, including the cost of labor, nets, boats, and licensing fees, to determine the optimum level of fish that should be removed.[55] In terms of Figure 2, the total cost curve is just as relevant as

---

[45] *Id.* at 40-41.

[46] *Id.*

[47] LAWSON, *supra* note 24, at 39.

[48] *Id.* at 269.

[49] CUNNINGHAM, *supra* note 11, at 45.

[50] *Id.* at 44.

[51] LAWSON, *supra* note 24, at 41-42.

[52] Interest rates do not fundamentally alter the analysis. Positive interest rates will encourage fishers to remove more fish today so that interest can be made on the money. An infinite interest rate would cause the efficient fisher to remove the fish at the level of E^c on Figure 3, where the total cost curve intersects the total benefit curve. TIETENBERG, *supra* note 5, at 310. Interestingly, this is the same point to which fishers will fish in a commonly owned fishery. LAWSON, *supra* note 24, at 39. Empirical studies indicate the dynamic-efficient catch rate, which includes positive interest rates, is usually smaller than the maximum sustainable yield. TIETENBERG, *supra* note 5, at 310.

[53] TIETENBERG, *supra* note 5, at 260-61.

[54] *Id.* at 312.

[55] LAWSON, *supra* note 24, at 41-42.

the total benefit curve in determining the level of fishing effort the private fisher will apply.

Figure 2 graphically displays the level of fishing effort the free market drives a fisher to employ in a privately owned fishery. The vertical distance between each point on the total benefit curve and the total cost curve represents the net benefit of fishing at the corresponding point of fishing effort.[56] The larger the vertical distance, the greater the net benefit.[57] The vertical distance between the total benefit curve and the total cost curve is greatest at point E^e.[58] Since profit is maximized at this point, the rational owner of a private fishery will employ a fishing effort equal to E^e. If the fisher continued to fish beyond point E^e, the costs would rise more quickly than the benefits, causing the fisher to lose profits.[59] This principal is shown graphically where the distance between $C(E^m)$ and $C(E^e)$ is greater than the distance between $R(E^m)$ and $R(E^e)$, demonstrating that fishing beyond level E^e results in lost profit.[60]

Another method of reaching the same conclusion is through marginal benefit/marginal cost analysis.[61] A rational fishery owner will continue to fish as long as the benefit of each additional unit of effort is larger than the cost of that additional unit of effort.[62] When marginal benefit equals marginal cost, the fisher will stop increasing effort because the rational fisher will not increase fishing effort when the costs of doing so exceed the benefits.[63] Marginal cost is equal to the slope of the total cost curve, and marginal benefit is the derivative of the total benefit curve at each point on the curve. Thus, where a line parallel to the total cost curve can be drawn tangent to the total benefit curve, marginal cost equals marginal benefit. This is point E^e on Figure 3.

The rational fisher in a privately owned fishery will harvest fish to the marginal cost/marginal benefit intersection, represented by point E^e on Figure 3. At quantities of fishing effort less than E^e, the marginal benefit of increasing effort is greater than the marginal cost. At points higher than

---

[56] *Id.* at 39.

[57] *Id.*

[58] TIETENBERG, *supra* note 5, at 308-9.

[59] LAWSON, *supra* note 24, at 39.

[60] The maximum sustainable yield, E^m, will only be harvested in a private fishery under the static-efficient model where total costs are zero, represented by a flat line on the horizontal axis. TIETENBERG, *supra* note 5, at 308-9. In the dynamic-efficient model, rational fishers could harvest a maximum sustainable yield in a private fishery where total costs are low and interest rates rise to a sufficiently high level. *Id.* at 309-10.

[61] *Id.* at 310, 312.

[62] *Id.*

[63] *Id.*

E^e, the marginal cost of augmenting fishing exceeds the marginal benefit. Market forces propel the private fisher to the E^e equilibrium. This level of fishing effort is economically efficient because the fishing industry maximizes profit. Additionally, this solution is socially optimal because society invests capital and labor in the most productive manner.[64] If the fishing industry employed less capital or labor, fisheries resources would be underutilized. If the industry invested more capital or labor, fisheries resources would be excessively exploited.[65]

C. The Commonly Owned Fishery Model

Commonly owned fisheries present strikingly different characteristics than privately owned fisheries. Because ocean fisheries are not privately owned, the free market's "invisible hand" fails to guide them to an economically efficient level of fish harvesting.[66] Instead, market forces in a commonly owned fishery compel fishers to enter the market and increase levels of capital investment until the fishery becomes exhausted.[67] An individual fisher cannot successfully exclude other fishers from harvesting the resource.[68] A fisher who attempts to conserve some fish for tomorrow's harvest will lose them to competitors today.[69] The incentive therefore is to harvest as many fish as possible while disregarding the long-term health of the resource.[70] Thus, the free market in a common property regime loses its prescience. It no longer allocates resources efficiently.[71]

Figure 3 graphically depicts the common resource problem. Recall that the private fishery owner will not fish beyond level E^e, where marginal cost equals marginal revenue.[72] To do so would reduce the future profit of the fishery. In the common fishery, a fisher who harvests beyond level E^e will decrease profit to the fishery as a whole, but not necessarily to himself or herself.[73] Most of the loss falls on the other fishers.[74] In the commonly owned fishery, fishers will collectively increase effort to the point where

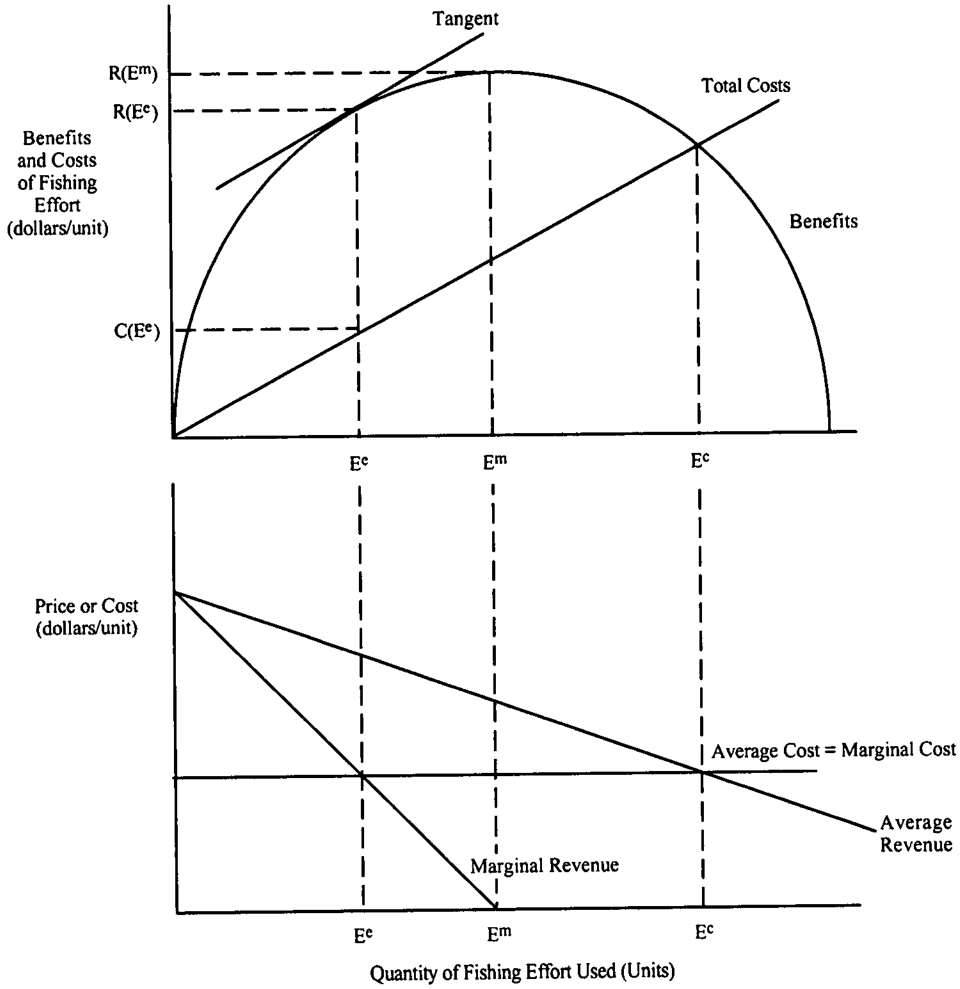
[64] CUNNINGHAM, *supra* note 11, at 101.
[65] LAWSON, *supra* note 24, at 39.
[66] Siegel, *supra* note 17, at 24.
[67] John, *supra* note 4, at 4-5.
[68] Johnston, *supra* note 22, at 6-7.
[69] Tipton, *supra* note 4, at 382.
[70] *Id.*
[71] Siegel, *supra* note 17, at 28.
[72] TIETENBERG, *supra* note 5, at 312.
[73] Arnason, *supra* note 8, at 3-4.
[74] *Id.*

average cost equals average revenue.[75] At every point past the marginal cost/marginal benefit intersection, increased fishing effort lowers the profit to the industry as a whole.[76] The individual fisher, however, is not concerned with the industry, but with his or her own ability to extract profit from the fishery.[77] The commonly owned fishery therefore draws new fishers and additional capital until all of the profit in the industry has been absorbed.[78]

---

[75] LAWSON, *supra* note 24, at 39.
[76] *Id.*
[77] Siegel, *supra* note 17, at 28.
[78] Johnston, *supra* note 22, at 13.

Figure 3
Market Solution of a Common Property Fishery



Fishers in commonly owned fisheries will augment fishing effort until total costs equal total benefits and all the profit in the industry is absorbed. This economically inefficient solution is represented by point E^c on the graph.

E^c represents the point where average revenue equals average cost. The difference between the total revenue curve and the total cost curve is zero at E^c so that no economic rent[79] exists in the fishery.[80] At levels of fishing effort lower than E^c, the fishery attracts more fishers and more capital.[81] At fishing levels greater than E^c, total costs in the industry surpass total benefits, forcing fishers to leave the unprofitable fishery until the market reaches point E^c again.[82] The market drives the commonly owned fishery inevitably to an economically suboptimal equilibrium represented by the point E^c.[83]

The open access fishery exhibits a typical cycle. High catch rates initially create substantial profits that attract other fishers to the resource.[84] Competition among fishers then promotes a technological race for faster equipment, even as fish stocks dwindle.[85] Ultimately, fishers intensify capital expenditures in competition for a deteriorating fishery until the earnings from fishing merely cover the costs of labor and capital, and economic rent is completely dissipated.[86] In a commonly owned fishery, fishing capacity continues to expand as long as individual fishers can hope to extract a positive return from the fishery.[87]

The common fishery equilibrium harms society by leaving the resource exhausted.[88] The fishery is harvested to inefficiently small population levels, resulting in progressively lower sustainable yields for future generations of fishers.[89] Overfishing reduces the fish stock to population levels far below the level corresponding to MSY, so that total annual catches of fish actually decrease despite the greatly increased fishing effort.[90] The open access fishery is also economically inefficient because society invests excessive quantities of capital and labor in the resource.[91] Reallocation of these resources to other sectors of our economy would result in a net benefit to society.[92]

---

[79] Economic rent in fisheries is defined as the value of landings minus the cost of catching and delivering the fish. John, *supra* note 4, at 5.

[80] CUNNINGHAM, *supra* note 11, at 102.

[81] LAWSON, *supra* note 24, at 39.

[82] CUNNINGHAM, *supra* note 11, at 45.

[83] LAWSON, *supra* note 24, at 39.

[84] John, *supra* note 4, at 4.

[85] *Id.*

[86] *Id.* at 4-5.

[87] *Id.* at 5.

[88] Tipton, *supra* note 4, at 382-83.

[89] Loayza, *supra* note 19, at 3.

[90] *Id.*

[91] Johnston, *supra* note 22, at 6.

[92] LAWSON, *supra* note 24, at 39.

D. Support for Theoretical Predictions

Empirical data confirm the conclusions predicted by the theoretical graphs. Currently, fourteen of the most economically valuable species of fish, including swordfish, cod, haddock, flounder, and Atlantic bluefin tuna, are close to commercial extinction.[93] Additionally, the number of over-fished stocks rose from twenty-one in 1976 to sixty-eight in 1992.[94] The National Marine Fisheries Service (NMFS) estimates that sustained harvests of a healthy haddock population in Georges Bank could reach 100 million pounds per year.[95] Stocks are currently so depleted in Georges Bank, however, that fishers landed less than fifteen million pounds of fish, and even this catch was determined to be above sustainable yield due to the small size of the current fish population.[96] Similarly, the estimated spawning stock of yellowtail flounder is only eleven percent of what Georges Bank could support.[97] Because fish populations there have dwindled by as much as ninety percent for some fish stocks, large portions of Georges Bank are closed completely to fishers.[98] Throughout the New England area, seventeen percent of the Atlantic waters are closed to fishers.[99] Overfishing of depleted groundfish currently costs New England an estimated $350 million annually and 14,000 lost jobs.[100]

The Pacific halibut fishery epitomizes the plight of the commonly owned fishery. Overfishing caused catches to decline in the Pacific halibut fishery by fifty percent.[101] In an attempt to solve the overfishing problem, Canada and the United States established an international commission to rebuild the stocks. The commission studied the problem and initiated a policy of limiting the duration of the fishing season.[102] Nevertheless, fish stocks continued to plummet during the 1970s, even though the fishing

---

[93] Tipton, *supra* note 4, at 384.

[94] James E. Wilen, *U.S. Fishery Regulation Policy: Lessons for Peru, in* MANAGING FISHERY RESOURCES: WORLD BANK DISCUSSION PAPERS NO. 217, FISHERIES SERIES 39, 41 (Eduardo A. Loayza ed., World Bank 1994).

[95] Schneider, *Breaking Georges Bank: Controversy Over Fishing Problems in One Atlantic Ocean off of the New England Coast*, 95 AUDUBON 84 (Aug. 1993).

[96] *Id.*

[97] *Id.*

[98] Tipton, *supra* note 4, at 384.

[99] *Id.* at 384 n.18.

[100] *Id.*

[101] Peter H. Pearse, *From Open Access to Private Property: Recent Innovations in Fishing Rights as Instruments of Fisheries Policy*, 23 OCEAN DEV. & INT'L L. 71, 73 (1992).

[102] *Id.*

season was reduced to a few short weeks.[103] By 1989, the fragile halibut fishery became so depleted that the commission reduced the season to thirty-six hours.[104] This fishery exemplifies the perpetual cycle of commonly owned fisheries. Fishing fleets expand in a race to capture as many fish as possible, without regard to the consequences for future harvests.[105] Capital expenditures increase, technological sophistication of the fleet expands, and fish stocks dwindle until no profit remains in the fishery.[106] Profitable fisheries are inherently unstable; they are driven, ultimately, to an equilibrium of zero profit.[107] Because the market drives individually rational fishers to this suboptimal equilibrium, this process has been termed the "collective irrationality of individually rational actions."[108]

The excessive capitalization of the fishing industry explains how the Pacific halibut fishing fleet is capable of harvesting an entire season's stock in only thirty-six hours. The economic incentives built into a common resource fishery drive the fishers to augment capital, technology, and labor, even though the fishing fleet as a whole has more than enough ability to capture the entire fish stock.[109] The overcapitalization[110] of fisheries is further evidenced by the United Nations Food and Agriculture Organization's estimate that the fishing industry spends $124 billion annually to harvest $70 billion worth of fish.[111] The Magnuson Act represents Congress' attempt to resolve these issues and to revitalize the United States fishing industry.

III. The Magnuson Act

Congress passed The Magnuson Act to reverse the deterioration in fish stocks, to prevent the overharvesting of fish, and to stop the decline in income to fishers.[112] The main impetus behind passage of the Magnuson

---

[103] *Id.*

[104] *Id.*

[105] *Id.* at 74.

[106] Pearse, *supra* note 101, at 74.

[107] *Id.*

[108] Seth Macinko, *Public or Private?: United States Commercial Fisheries Management and the Public Trust Doctrine: Reciprocal Challenges*, 33 NAT'L RESOURCES J. 919, 921 (1993).

[109] Tipton, *supra* note 4, at 383.

[110] Overcapitalization describes the superfluous diversion of machinery, equipment, and money into a sector of the economy that is already full. CUNNINGHAM, *supra* note 11, at 97.

[111] PETER WEBER, *Abandoned Seas: Reversing the Decline of the Oceans*, WORLDWATCH PAPER 116, Nov. 1993, at 5. Government subsidies permit the fishing industry to incur net losses over the long term without massive unemployment of fishers. *See infra* Part IV.C.3.

[112] § 1801(a).

Act nevertheless emerged as perceived foreign domination of our domestic fisheries.[113]

Congress held foreign fleets responsible for the decline in United States fisheries. Senator Hathaway from Maine noted that in 1960, eighty-eight percent of the harvest in Georges Bank was taken by domestic fishers.[114] By 1972, foreign fishing accounted for a full eighty-nine percent of the total catch within 200 miles of American coasts.[115] Foreign vessels came from countries as far away as Japan, Poland, and the Soviet Union to dominate landings[116] throughout United States waters.[117] They used high technology trawlers that dwarfed American boats in size and technological ability.[118] By 1976, foreign vessels harvested 2.3 million metric tons of fish from United States waters.[119] Foreign fleets contributed to the severe depletion of the then most valuable commercial stocks of fish in the United States.[120]

Prior to passage of the Magnuson Act, the United States had little ability to prevent foreign or domestic overfishing. The Federal Extra-Territorial Waters Act[121] established federal jurisdiction up to nine miles seaward from the coastal states' three-mile territorial sea.[122] Neither the states nor the federal government possessed the authority to control international fishing in the high seas, which began twelve miles from United States coasts.[123] To the extent the United States curtailed its own domestic harvest, fishers from other countries would take the excess.[124]

---

[113] William R. Rogalski, *The Unique Federalism of the Regional Councils under the Fishery Conservation and Management Act of 1976*, 9 ENVTL. AFF. 163, 169 (1980).

[114] STAFF OF SEN. COMM. ON COMMERCE, 94TH CONG., 2D SESS., A LEGISLATIVE HISTORY OF THE FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976 450 (Comm. Print 1976).

[115] *Id.*

[116] Landings are defined as the quantity of fish, shellfish, and other aquatic plants and animals sold ashore. NAT'L MARINE FISHERIES SER., FISHERIES OF THE UNITED STATES 116 (1978). Landings are frequently measured according to weight. *Id.*

[117] Schneider, *supra* note 95, at 87.

[118] *Id.*

[119] Bruce D. Stutz, *Catch as Catch Can, United States Fishing Fleet*, TECH. REV., May-June 1984, at 68, 71.

[120] Rogalski, *supra* note 113, at 169 (citing H.R. Rep. No. 94-445, 94th Cong., 1st. Sess. 29 (1975)).

[121] 16 U.S.C. §§ 1091-94 (1970) (repealed 1976).

[122] *Id.* § 1092. The territorial sea was established at three miles because customary international law held that a state could control territory only up to the maximum range of its fire power, which at the time the law developed, was three miles. John Winn, Alaska v. FN Baranof: State Regulation Beyond the Territorial Sea After the Magnuson Act, 13 ENVTL. AFF., (1986).

[123] Rogalski, *supra* note 113, at 168.

[124] Arnason, *supra* note 8, at 39.

This fact made conservation efforts among domestic fishers futile, because foreign fleets would take any fish domestic fishers managed to conserve.[125] International fishing treaties often proved ineffectual because each nation policed its own fishers, and nations like Japan and the Soviet Union which possessed tremendous fishing fleets failed to adequately supervise people in their fishing industries.[126] Foreign governments exacerbated the problem by subsidizing their fleets.[127] Congress passed the Magnuson Act to achieve two goals. First, the Act would protect the United States fishing industry from the perceived threat of foreign domination.[128] Second, the Act would enable the United States to rebuild and conserve devastated fisheries.[129]

A. *The Authority of the Magnuson Act*

The Magnuson Act establishes exclusive United States authority over virtually all marine resources within 200 miles of United States shores.[130] Government authority was previously limited to the three miles of territorial sea controlled by each state, and the nine miles of federal authority under the Federal Extra-Territorial Waters Act.[131] The Magnuson Act extends federal authority 197 miles seaward from the states' three-mile territorial sea.[132] The 197-mile extension is referred to as the Exclusive Economic Zone (EEZ)[133] and encloses 2,250,000 square miles of ocean space.[134] The Act thereby takes control of one-fifth of the world's marine fishery resources.[135] It establishes broad management control over fish and all other forms of marine animal and plant life other than marine mammals, birds, and highly migratory species[136] in the EEZ.[137]

---

[125] *Id.*

[126] Winn, *supra* note 122, at 282.

[127] *Id.*

[128] Rogalski, *supra* note 113, at 169.

[129] *Id.*

[130] 16 U.S.C. § 1811.

[131] 16 U.S.C. §§ 1091-94 (1970) (repealed 1976).

[132] For historical reasons, Texas retains jurisdiction over a territorial sea three marine leagues, or approximately nine nautical miles in width. Florida also holds a nine nautical mile territorial sea on its West side into the Gulf of Mexico. On the Atlantic side, however, Florida's territorial sea is three nautical miles. *See* United States v. Florida, 363 U.S. 121 (1960).

[133] 16 U.S.C. § 1812.

[134] OFFICE OF TECHNOLOGY ASSESSMENT, ESTABLISHING A 200 MILE FISHERIES ZONE 24 (1977).

[135] *Id.* at 3.

[136] The Magnuson Act defines "highly migratory species" as "tuna species, marlin (Tetrapturus spp.), oceanic sharks, sailfishes (Istiophorus), and swordfish (Xiphias gladius)." § 1802(14). Highly migratory species are excluded from the authority of the Magnuson Act, the

The Magnuson Act establishes jurisdiction over all anadramous fish[138] throughout the entire range of their migration.[139] Jurisdiction extends even when these fish swim beyond the 197-mile EEZ.[140] For anadramous fish, United States jurisdiction ends only where another nation's recognized fishery zone begins.[141] Jurisdiction also extends to all Continental Shelf fishery resources, even if beyond the EEZ.[142] The Magnuson Act regulates all fishing, defined as the attempted or actual "catching, taking or harvesting of fish" that is not done for scientific purposes.[143]

The states retain jurisdiction over their three-mile territorial sea and may make their own fisheries regulations within these waters.[144] The states' regulations will be preempted, however, where a federal fishery management plan (FMP) exists for a given fishery and where the Secretary of Commerce finds that a state's actions "substantially and adversely affect" the regional council's FMP.[145] The Secretary then notifies the state that the regional council will regulate the fishery within the state's territorial sea.[146] Federal courts have held that under some circumstances a state may regulate fisheries even outside its territorial sea.[147]

Congress did not contemplate the complete preemption of state regulation within the EEZ.[148] Instead, Congress intended to limit state regulation of vessels outside the state's territorial sea to ships registered under the laws of that state.[149] States may regulate vessels registered under state law even if outside the territorial sea unless conflicting federal regulations exist.[150] To avoid conflict between state and federal fishery plans, and to avoid preemption where possible, the Secretary of Commerce

---

Act stating only that the United States will cooperate with the international community to ensure conservation of these species. § 1812.

[137] 1812(a)(1).

[138] Anadramous fish, such as salmon, are defined in the Magnuson Act as "species of fish which spawn in fresh or estuarine waters of the United States and which migrate to ocean waters." § 1802(1).

[139] § 1811.

[140] § 1811(b)(1).

[141] *Id.*

[142] § 1811(b)(2).

[143] § 1802(10).

[144] § 1856(2)(A).

[145] § 1856(b)(1).

[146] *Id.*

[147] Anderson Seafoods, Inc. v. Graham, 529 F. Supp. 512, 513 (N.D. Fla. 1982).

[148] *Id.*

[149] *Id.*

[150] *Id.* The state's regulations will not be preempted until implementing regulations for a fishery management plan are issued. An approved fishery management plan standing alone does not suffice to preempt. *Id.*

has urged regional councils to cooperate with state agencies when formulating FMPs.[151] This policy promotes unified regulation of fisheries.

B. Structural Hierarchy

The Magnuson Act creates a structural hierarchy that is unique to federal agencies. The Act recognizes the historic role of the states in managing fisheries and acknowledges that local governments may be more capable of developing a fishery plan suited to the peculiar needs of the region than the federal government.[152] The Act empowers the states by creating eight regional councils,[153] each with the power to create FMPs for its region.[154] Nevertheless, the Act balances the regional interests by imposing a strong federal presence. The Secretary of Commerce must approve any FMP before it becomes law.[155]

Each regional council balances state, federal, and commercial concerns by employing individuals representing each of those three interests. Councils make decisions by majority vote.[156] Therefore, the composition of each council determines how an FMP will be written. The Magnuson Act provides for the following voting members to sit on regional councils. First, the governor of each constituent state appoints one principal state official with marine fishery management responsibility to sit on the regional council.[157] Additionally, each council employs a regional director of the NMFS.[158] Third, the Secretary of Commerce appoints

---

[151] Winn, *supra* note 122, at 324.

[152] Rogalski, *supra* note 113, at 175.

[153] The eight regional councils are the New England, Mid-Atlantic, South Atlantic, Caribbean, Gulf, Pacific, North Pacific, and Western Pacific Councils. The regional councils are composed of the following constituent states: The New England Council includes Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut. The Mid-Atlantic Council is composed of New York, New Jersey, Delaware, Pennsylvania, Maryland, and Virginia. The South Atlantic Council includes North Carolina, South Carolina, Georgia, and Florida. The Caribbean Council comprises the Virgin Islands and Puerto Rico. The Gulf Council contains Texas, Louisiana, Mississippi, Alabama, and Florida. The Pacific Council includes California, Oregon, Washington, and Idaho. The North Pacific Council comprises Oregon, Washington, and Alaska. Finally, the Western Pacific Council contains Hawaii, American Samoa, and Guam. § 1852.

[154] § 1852(h)(1).

[155] Many of the duties assigned to the Secretary of Commerce in the Magnuson Act have been delegated to the National Oceanic and Atmospheric Administration. Rogalski, *supra* note 113 at 175.

[156] § 1852(e)(1).

[157] § 1852(b)(1)(A).

[158] § 1852(b)(1)(B)(3). The National Marine Fisheries Service is an organization within the National Oceanic and Atmospheric Administration, which in turn is a part of the Department of Commerce. Rogalski, *supra* note 113, at 172, n.47.

council members who are either knowledgeable regarding the conservation and management of fisheries, or informed with respect to the commercial or recreational harvest of fishery resources.[159] The Secretary selects the appointments from a list prepared by the governor of each state.[160] Nevertheless, the Secretary develops the guidelines for determining which individuals to include on the governor's list.[161] The Secretary reviews the qualified candidates, and may find that an individual is not qualified to appear on the governor's list.[162] The Secretary may then require the governor to submit a revised list.[163] The governor must also consult with representatives of the commercial and recreational fishing industries before submitting the list of potential council members to the Secretary.[164] All voting members serve for three-year terms.[165] Critics argue that most of the seats of the voting council members have been filled by industry participants who do not strongly embrace the goal of conservation.[166] In fact, industry participants have filled many of the seats on the councils.[167] The Magnuson Act exempts council members from 18 U.S.C. § 208, which prohibits official acts that advance a personal financial interest.[168]

In addition to voting members, each regional council is also composed of nonvoting members who serve an advisory role. A representative of the United States Fish and Wildlife Service sits on each regional council.[169] Additionally, each regional council includes the Coast Guard commander for the appropriate region.[170] Finally, the executive director of the NMFS and one representative of the Department of State serve on each regional council.[171] The nonvoting members of the council present a strong federal interest, while the voting members of the council represent predominantly regional interests.[172] Each regional council, therefore, maintains a balance between federal and state concerns. The ultimate

---

[159] § 1852(b)(1)(C).
[160] § 1852(b)(2)(C).
[161] § 1852(b)(2)(A).
[162] § 1852(b)(2)(C).
[163] *Id.*
[164] *Id.*
[165] § 1852(b)(3).
[166] Robert J. McManus, *America's Saltwater Fisheries: So Few Fish, So Many Fishermen*, NAT. RESOURCES & ENV'T. 13, 14 (Spring 1995).
[167] *Id.*
[168] *Id.*
[169] U.S.C. § 1852(b)(2)(C).
[170] § 1852(b)(3).
[171] *Id.*
[172] Rogalski, *supra* note 113, at 173.

function of each regional council is to prepare FMPs for fisheries which the councils determine require regulation.

C. Development of a Fishery Management Plan

The regional councils and the Secretary of Commerce join in the complex task of creating an FMP.[173] The regional council begins the process by selecting a fishery in need of conservation and management.[174] It then drafts an FMP for the fishery[175] and submits the plan to the Secretary of Commerce for review.[176] The proposed plan must contain conservation and management measures to prevent overfishing, and to protect, restore, and promote the long-term health and stability of the fishery.[177] In addition, the proposed plan must be consistent with seven national standards[178] detailed in the Magnuson Act.[179] The proposed

[173] Fishery management plans currently exist for thirty-four fisheries, including the American Lobster, Atlantic Billfishes, Atlantic Bluefish, Atlantic Coast Red Drum, Atlantic Mackerel, Squid, and Butterfish, Atlantic Salmon, Atlantic Sea Scallops, Atlantic Sharks, Atlantic Surf Clam and Ocean Quahogs, Northeast Multispecies, Summer Flounder, Swordfish, Gulf and South Atlantic Spiny Lobster, Caribbean Shallow Water Reef Fish, Gulf and South Atlantic Corals, Gulf of Mexico Reef Fish, Gulf of Mexico Shrimp, Gulf of Mexico Stone Crab, Coastal Migratory Pelagics, Caribbean Spiny Lobster, South Atlantic Snapper/Grouper, South Atlantic Shrimp, Northern Anchovy, King and Tanner Crab, Commercial and Recreational Salmon, High Seas Salmon, Pacific Coast Groundfish, Gulf of Alaska Groundfish, Bering Sea and Aleutian Islands Groundfish, Western Pacific Crustaceans, Western Pacific Precious Corals, Western Pacific Bottomfish and Seamount Groundfish, Gulf of Mexico Red Drum, and Western Pacific Pelagics. Fishery management plans are currently being prepared for Foreign Trawl Fisheries of the Northwest Atlantic, Hake Fisheries of the Northwestern Atlantic, Pacific Billfishes and Oceanic Sharks, Bering Sea Herring and Bering Sea Snails. U.S. Dep't of Commerce FISHERIES OF THE UNITED STATES, 1993, at 91.

[174] § 1852(h)(1).

[175] § 1853(a).

[176] § 1854(a).

[177] § 1853(a)(1)(A).

[178] The Magnuson Act, creates seven national standards for fishery management and conservation. 16 USC § 1851(a). They are:

> (1) Conservation and management shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.
>
> (2) Conservation and management measures shall be based upon the best scientific information available.
>
> (3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.
>
> (4) Conservation and management measures shall not discriminate between residents of different states.
>
> (5) Conservation and management measures shall, where practicable, promote efficiency in the utilization of fishery resources; except that no such measure shall have

FMP must specify the fishery to be regulated and the number of fishing vessels involved,[180] and it must describe the habitat of the fishery.[181]

The NMFS assists in FMP development through the collection of biological and statistical data on fish stocks.[182] These data are generated through sample trawling by research vessels, and through examination of logbooks and records kept by fishers.[183] Regional councils also establish a scientific and statistical committee to assist in gathering industry information for the purpose of creating an FMP.[184] The regional councils must use the scientific and statistical information to estimate the MSY each fishery is capable of producing.[185]

1. Maximum Sustainable Yield.

The heart of each FMP is the MSY determination.[186] From this calculation, the council sets the number of fish that may be harvested for a given season.[187] The Magnuson Act requires each regional council to specify the present and future MSY for each fishery it regulates.[188] From the MSY calculation, the council determines the optimum yield of fish that may be harvested.[189] The Magnuson Act defines "optimum yield" as the amount of fish

> (A) which will provide the greatest overall benefit to the Nation, with particular reference to food production and recreational opportunities; and

---

> economic allocation as its sole purpose.
>
> (6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
>
> (7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

Id.

179 § 1853(a)(1)(C).
180 § 1853(a)(2).
181 § 1853(a)(7).
182 PIERCE, *supra* note 9, at 1.
183 *Id.*
184 § 1852(g).
185 § 1853(a)(3).
186 *Id.*
187 *Id.*
188 *Id.*
189 *Id.*

> (B) which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social, or ecological factor.[190]

Each FMP must specify the percentage of the optimum yield that will be harvested by domestic fishers.[191] Any remainder is to be allocated to foreign vessels.[192] Thus, the Magnuson Act resolves the problem of foreign domination of United States fisheries by granting domestic fishers all of the optimum yield domestic fishers can harvest, and reserving only the potential excess for foreign fleets. Currently, regional councils allocate only a nominal percentage of the optimum yield for each FMP to foreign interests.[193]

2. *Enforcement Mechanisms.*

The Magnuson Act grants regional councils substantial discretion to devise enforcement mechanisms to implement their FMPs. The councils may devise FMPs that require fishers to pay fees to the Secretary.[194] The FMP may limit fishing to designated zones, designated times, or certain types of vessels.[195] The councils may prohibit the use of certain fishing gear or limit the quantity of fishing gear allowed in a fishery.[196] The FMP may establish limits on catch by area, species, size, number, weight, sex, total biomass, or other factors.[197] Additionally, the Magnuson Act explicitly authorizes limiting access to the fishery to achieve the optimum yield calculation.[198] An FMP may require fishing vessels to provide data

---

[190] § 1802(21). Economists would argue that the optimum yield calculation should be based on the intersection of the marginal cost and marginal revenue curves, so that the number of fish harvested in the common property fishery would be forced through regulation to correspond to the number of fish harvested in a private fishery. LAWSON, *supra* note 24, at 39. On Figure 3, the economists' solution is represented as point E^e. The marginal cost, marginal revenue intersection represents the efficient harvest for a fishery. TIETENBERG, *supra* note 5, at 262. Critics of the Magnuson Act argue that the optimum yield calculation is currently a "slippery" calculation that represents a compromise between warring industry and regulatory participants, and regional and national participants, and is ultimately a "value-laden policy decision." Rogalski, *supra* note 113, at 170.

[191] § 1853(a)(4)(A).

[192] § 1853(a(4)(B).

[193] McManus, *supra* note 166, at 15.

[194] § 1853(b)(1).

[195] § 1853(b)(2).

[196] *Id.*

[197] § 1853(b)(3).

[198] § 1853(b)(6).

to the regulators,[199] and it may mandate that vessels carry observers on board for the purpose of collecting data for the conservation and management of a fishery.[200] Finally, the Magnuson Act contains an enforcement catch-all clause authorizing the council to "prescribe such other measures, requirements, or conditions . . . as are determined to be necessary and appropriate for the conservation and management of the fishery."[201]

The Magnuson Act's enforcement provisions have teeth, authorizing fines for violations at a maximum of $100,000 per day per violation.[202] The Act also enforces violations with criminal sanctions consisting of $100,000 fines and up to six months of imprisonment.[203] The Secretary has the authority to revoke, suspend, or deny the permit of any vessel found violating provisions of the Act.[204] The Coast Guard in conjunction with an officer authorized by the Secretary may seize any fishing vessel, its gear, furniture, appurtenances, and cargo, including fish, for violations of FMP regulations.[205] An officer in conjunction with the Coast Guard may also arrest any person suspected of violating an FMP on the basis of reasonable cause.[206] In addition, an officer may board, search, inspect and seize any fishing vessel, seize any fish, and gather any other evidence related to a violation of any provision of the Act.[207]

3. Secretarial Review.

Once the regional council completes the draft FMP, the council sends the plan to the Secretary of Commerce for review.[208] During the review, the Secretary determines whether the FMP is consistent with the national standards.[209] The Secretary may approve, disapprove, or partially disap-

---

199 § 1853(b)(7). After fishers expressed reluctance to share data with regulators because of the danger of losing secret high-density fishing areas to common knowledge, the Magnuson Act answered the concern by providing that any statistics submitted to the Secretary in compliance with §§ 1853(a) and 1853(b) of the Act shall be confidential and shall not be disclosed to persons other than Magnuson Act regulators. § 1853(d).

200 § 1853(b)(8).

201 *Id.*

202 16 U.S.C. § 1858(a).

203 § 1859(b).

204 § 1858(g).

205 § 1860(a).

206 § 1861(b)(1)(A).

207 16 U.S.C. § 1861(b).

208 § 1854(a)(1)(A).

209 § 1854(a)(1)(A) & (B).

prove any FMP.[210] The Act requires the Secretary to immediately publish in the Federal Register a notice that the plan is available and that interested persons may submit written comments to the Secretary during a sixty–day period beginning on the receipt day.[211] "Receipt day" is defined as the fifth day after the day on which a council transmits to the Secretary an FMP.[212]

The Secretary of Commerce must take into consideration the comments of interested persons,[213] consult with the Secretary of State regarding the foreign fishing component,[214] and consult with the Coast Guard regarding enforcement of the plan at sea.[215] Fifteen days after receipt of the plan, the Secretary must make any necessary changes in the proposed FMP and publish the amended regulations in the Federal Register.[216] The proposed FMP becomes law if the Secretary does not notify the council in writing of disapproval or partial disapproval before the close of the ninety-fifth day after the day of receipt.[217] The FMP also becomes law if the Secretary notifies the council in writing at any time after the sixty-day comment period that he or she does not intend to disapprove the plan.[218]

If the Secretary disapproves or partially disapproves a plan, the Secretary must notify the council of the disapproval and specify how the plan is inconsistent with law, and recommend action the council may take to remedy the defect.[219] The council may then submit a revised FMP or an amendment to the proposed FMP.[220] The Secretary must then immediately review the revised plan and publish in the Federal Register a notice that the revised plan is available.[221] This initiates a new thirty-day comment period.[222] The Secretary has sixty days after receiving the revised FMP to approve, disapprove, or partially disapprove it, otherwise the FMP becomes law.[223]

---

210 § 1854(a)(1)(D) & (b)(2).
211 § 1854(a)(1).
212 § 1854(a)(3)(B).
213 § 1854(a)(2)(A).
214 § 1854(a)(2)(B).
215 § 1854(a)(2)(C).
216 § 1854(a)(1)(D).
217 § 1854(b)(1)(A).
218 § 1854(b)(1)(B).
219 § 1854(b)(2).
220 § 1854(b)(3)(A).
221 *Id.*
222 *Id.*
223 *Id.*

If a council fails to develop and submit an FMP "after a reasonable period of time" for a fishery that requires conservation and management, the Secretary in place of the council may prepare an FMP according to the National Standards.[224] Additionally, the Secretary may prepare a plan if the council fails to resubmit a proposed FMP within a reasonable time after the Secretary disapproves the original plan.[225]

4. *Additional Regulations.*

The pace of FMP development has been slowed considerably by regulations created by the NMFS. The NMFS has crafted a five-step master plan[226] for the development of FMPs. The first step begins with identification of the stock of fish to be managed as a unit under the plan.[227] The National Oceanic and Atmospheric Administration has determined that the National Environmental Policy Act[228] applies to the councils at this stage of the process, thus requiring councils to prepare environmental impact statements detailing the effects to the environment of proposed FMPs.[229] Step two involves preparation of a draft plan, a draft regulatory analysis, a draft environmental impact statement, and draft proposed regulations.[230] Step three consists of placing a notice in the Federal Register that the draft FMP is available for public review.[231] Additionally, the NMFS begins intensive review of the draft FMP as a prelude to full review by the Secretary of Commerce.[232] After the NMFS and the public have reviewed the draft FMP, the council has authority to approve the draft plan and convert it into an FMP.[233] Step four consists of review by the Secretary of Commerce of the FMP, and step five entails examination by the NMFS of the proposed regulations of the FMP.[234] The NMFS then publishes the proposed regulations in the Federal Register, initiating a new sixty-day public comment period.[235] The NMFS

---

224 § 1854(c)(1)(A).
225 § 1854(c)(1)(B).
226 NATIONAL MARINE FISHERIES SERVICE, DRAFT OPERATIONAL GUIDELINE FOR FISHERY MANAGEMENT PLAN PROCESS (1979).
227 Rogalski, *supra* note 113, at 181.
228 42 U.S.C. § 4321.
229 Rogalski, *supra* note 113, at 181.
230 *Id.* at 182.
231 *Id.* at 183.
232 *Id.*
233 *Id.*
234 *Id.*
235 *Id.* at 184.

reviews the public comments and prepares draft final regulations that are reviewed by the Coast Guard, the Department of State, and other concerned agencies.[236] Step five ends with publication of the draft regulations in the Federal Register and a new thirty-day public comment period.[237] The regulations become effective after the running of this period.[238]

The development of an FMP for one fishery takes, on average, 250 days.[239] The Magnuson Act grants the Secretary of Commerce emergency powers under the Magnuson Act to offset this time delay. Under § 1855(c), the Secretary may promulgate regulations for a fishery, whether or not an FMP exists, without abiding by publication requirements or holding public hearings. If the Secretary determines that an emergency exists involving fishery resources, or if the regional council so finds by a majority vote, the Secretary may promulgate for the jeopardized fishery emergency regulations which last ninety days.[240] Furthermore, if the council finds by unanimous vote that a fishery emergency exists, the Secretary becomes obligated to promulgate emergency regulations.[241]

5. *Judicial Review.*

After a proposed FMP has passed through the lengthy process of becoming law, challengers cannot easily attack it.[242] The Magnuson Act limits judicial review of an FMP to the procedural legality of the implementing regulations.[243] Thus an opponent of an FMP may properly assert that the Secretary of Commerce did not enact the FMP according to the seven national standards, but the opponent cannot challenge the FMP directly by claiming that the optimum yield calculation is unfair. The standard of review is whether the Secretary acted arbitrarily, capriciously, contrary to the Constitution, in excess of statutory authority, or contrary to procedures required by law.[244] The Magnuson Act denies challengers injunctive relief,[245] which prevents lengthy delays once an FMP is enacted. To avoid a motion to dismiss, a challenger must assert a claim

---

[236] *Id.*
[237] *Id.* at 185.
[238] *Id.*
[239] Rogalski, *supra* note 113, at 185.
[240] § 1855(c)(1) & § 1855(c)(2)(B).
[241] § 1855(c)(2)(A).
[242] McManus, *supra* note 166, at 15.
[243] § 1855(b).
[244] § 1855(d).
[245] *Id.*

before the council.[246] Furthermore, challengers who ultimately reach the courtroom find that the actions of the councils and of the Secretary command enormous deference and will not be lightly contradicted by the federal district courts.[247]

To summarize, the Magnuson Act's genesis lay in the ambitious goals of preventing foreign domination of United States fisheries and in reversing the depletion of fish stocks.[248] To achieve these goals, the Magnuson Act extended United States jurisdiction over virtually all marine resources to 200 miles from United States coasts.[249] Additionally, the Act created a complex hierarchy of eight regional councils to form FMP's in conjunction with the Secretary of Commerce. Each FMP establishes an optimum yield calculation for the fishery it regulates that assigns a high percentage of the catch to domestic fishers and that specifies a fish harvest that is sufficiently low to preserve rich sustainable yields. Part III of this Article will evaluate the success of the Magnuson Act in achieving its goals.

IV. Impact of the Magnuson Act

The Magnuson Act dramatically changed the composition of fishers who harvest resources in the waters of the United States. After passage of the Act, foreign fishers, who previously dominated the fishing industry in the United States, became excluded from United States waters within 200 miles of the coasts.[250] The Act decisively redistributed harvests and wealth from foreign fishers to United States fishers. Nevertheless, the Act failed to prevent the overfishing problem and fishery stocks have continued to dwindle since passage of the Act.[251] Part III of the Article will examine the impact of the Magnuson Act on foreign fishing and fish stocks. It will then address why the regional councils' emphasis on technology restrictions, licenses, and government subsidies has failed to prevent decline in fishery resources.

---

[246] Hanson v. Klutznik, 506 F. Supp. 582, 586 (D. Alaska 1981).
[247] McManus, *supra* note 166, at 15.
[248] Rogalski, *supra* note 113, at 169.
[249] 16 U.S.C. § 1811.
[250] § 1821(a).
[251] Loayza, *supra* note 19, at 41.

A. *Foreign Fishing*

The Magnuson Act succeeded in preventing foreign vessels from dominating landings within United States waters.[252] The provisions of the Act mandating an optimum yield calculation for each FMP are primarily responsible for this success. The Magnuson Act provides for each regional council to determine the optimum yield for regulated fisheries, and to allocate to foreign fishers only the portion of the optimum yield not reserved for domestic fishers.[253] Just one year after the Act was passed, foreign fishing in the EEZ dropped from 2.3 to 1.7 million metric tons, and the domestic harvest increased by sixteen percent.[254] Currently, the percentage of fish reserved for foreign vessels approaches zero.[255] Nevertheless, the exclusion of foreign vessels from United States waters did not solve or even address the central problem of undefined property rights inherent in the commonly owned fishery. In fact, the government's actions initially encouraged excessive capitalization and overfishing in United States fisheries.

B. *Fish Stocks*

Beyond excluding foreign fishers, Congress passed the Magnuson Act to prevent the depletion of fishery resources and to achieve high sustainable yields of fish products.[256] The Magnuson Act has been ineffectual in preventing the exhaustion of fisheries. In fact, the number of overharvested fish stocks has increased from twenty-one in 1976, the year the Magnuson Act was passed, to sixty-eight in 1992.[257] A 1993 review of thirty-three major species of fish in the Mid-Atlantic region found decreases in landings in almost all species surveyed, as a result of depleted fish stocks.[258] Oysters and yellow perch peaked in 1890 and, unaffected by the Magnuson Act, declined steadily by ninety-eight percent through 1991.[259] Bluefish and American shad declined over the same period by

---

[252] McManus, *supra* note 166, at 13.

[253] § 1853(a)(4).

[254] Stutz, *supra* note 119, at 71.

[255] McManus, *supra* note 166, at 13.

[256] § 1801(b)(3).

[257] Arnason, *supra* note 8, at 41.

[258] J.L. McHugh, *The Magnuson Act and the Middle Atlantic Fisheries*, 22 UNDERWORLD NATURALIST 9 (1990).

[259] *Id.* at 5

ninety-one percent.[260] Haddock catches on Georges Bank fell by ninety percent from 1983 to 1990.[261] On the Pacific side, ocean harvests of chinook and coho from the coasts of California, Oregon, and Washington deteriorated from 2.1 million fish in 1988 to 444,000 fish in 1992.[262] John P. Wise of the Center for Marine Conservation critiqued the Act as follows:

> It is obvious that the prime objective of the Magnuson Act, to eliminate overfishing of marine living resources off the U.S. coast, has not been met. Foreign overfishing has been replaced by domestic overfishing . . . . New legislation is not necessarily required; what is necessary is firm application of conservation principles referred to in the Magnuson Act.[263]

The Magnuson Act failed to prevent the depletion of marine resources because it erroneously identified foreign fishers as the crux of the overfishing problem. Once the regional councils removed foreign fishers from United States waters, the common resource problem remained and overfishing continued.[264]

C. *Overfishing*

The regulations employed by the regional councils under the Magnuson Act do not successfully prevent overfishing.[265] Predominantly, the regional councils govern fisheries with technology restrictions, licenses, permits and subsidies.[266] These tools fail to prevent overfishing because they do not address the intrinsic problem of fisheries, the common resource dilemma.[267] This section will first address the effects and limitations of technology restrictions. Then, the council's licensing and permitting efforts will be analyzed. Finally, this section will address government subsidies in the fishing industry.

---

[260] *Id.*

[261] Commercially inferior dogfish and skates now dominate the Georges Bank so that doubt exists as to whether the groundfish will ever reclaim their place in the ecosystem. *Id.*

[262] McManus, *supra* note 166, at 16.

[263] McHugh, *supra* note 258, at 9.

[264] Wilen, *supra* note 94, at 42.

[265] *Id.* at 41.

[266] Franz Thomas Litz, *Harnessing Market Forces in Natural Resources Management: Lessons From the Surf Clam Fishery*, 21 ENVTL. AFF. 335, 340 (1994).

[267] Wilen, *supra* note 94, at 42.

1. Technology Limits.

The regional councils have evinced a distressing reliance on technology restrictions to enforce optimum yield calculations.[268] Technology restrictions include limits on net size, motor capacity, and number of hours that fishers can harvest fish.[269] For example, where an FMP decreases the number and size of fishing nets that fishers may use, the fishers' capacity to catch fish decreases. To catch the same number of fish, the fishers must increase the time they spend fishing or they must purchase better equipment. Figure 4 graphically presents the consequences of technology restrictions as an upward rotation of the total cost curve.[270] Conceivably, costs could be increased to the point where the total cost curve intersects the total benefit curve at its peak, so that the MSY would be achieved.[271] From the perspective of Figure 4, regional councils could impose technology restrictions to reduce fishing effort from E^2 to E^1. The problem with this technique is that it comes at considerable cost to the efficiency of our economy. Fishers must intensify expenditures of labor and capital to achieve the same level of fish harvest.[272] Fishers can no longer use the combination of capital and labor that minimizes cost. Prices for consumers increase while salaries for fishers do not improve.[273] Additionally, technology restrictions do not address the common resource problem.[274] The economic incentive to harvest as many fish as possible drives the fishers to develop new technologies that are not restricted, thereby circumventing the regional councils' regulations.[275]

[268] Litz, *supra* note 266, at 340.

[269] One egregiously inefficient regulation in Bristol Bay Alaska prevented gill netters from using engines to sail their boats. TIETENBERG, *supra* note 5, at 320.

[270] *Id.* at 319-20.

[271] A better solution would be to use a tax on effort to rotate the total cost curve towards an optimum yield. The tax on fishers could be set at a level equal to the cost of technology restrictions, so that the cost of fishing would not change for fishers. Nevertheless, the tax would be collected by the government and could be redistributed rather than wasted on the forced use of inefficient technology. Where technology is restricted, all the costs that shift the total cost curve are real resource costs. Taxes are transfer costs that simply move wealth from one sector of the economy to another. *See* TIETENBERG, *supra* note 5, at 321. Nevertheless, the Magnuson Act provides in 16 U.S.C. § 1854(d) that the Secretary may not charge fishers fees in excess of the administrative costs. Thus, the Magnuson Act currently rejects a tax approach.

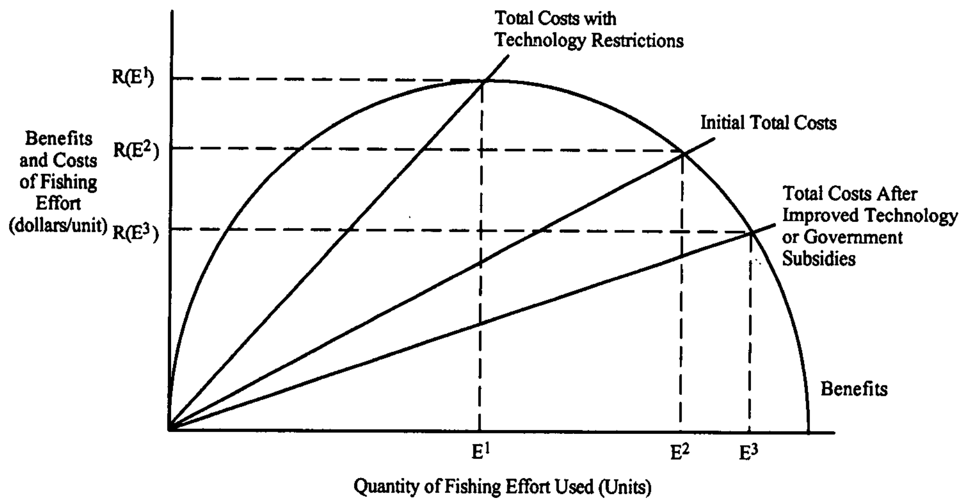
[272] TIETENBERG, *supra* note 5, at 319.

[273] *Id.*

[274] Litz, *supra* note 266, at 340.

[275] Tipton, *supra* note 4, at 390.

Figure 4
Rotating the Total Cost Curve



Technology restrictions raise the cost of fishing and lower the level of fishing effort fishers will employ. Government subsidies lower the cost of fishing and induce fishers to augment fishing effort.

Another popular technology restriction regional councils employ is time restrictions.[276] By mandating short fishing seasons, regional councils attempt to reduce the quantity of fish landed in a fishery.[277] The effect in terms of Figure 4 is to shift the total cost curve upward, because fishers must purchase expensive high-technology equipment to land the same number of fish in a short season that they landed during the longer season before the restrictions. The FMP for Pacific halibut, for example, limits the fishing season to thirty-six hours.[278] Fishers have responded by investing in new technology that harvests fish at an extraordinary rate.[279] Regulated fisheries become overcapitalized as a result of the artificial constraints the regional councils impose.[280] The result is a tug-of-war with respect to the total cost curve. The regional councils impose regulations that shift the curve to the left, reducing fishing and increasing costs. The fishers respond with new technologies that eventually lower costs and increase landings. Fishers in the Gulf of Mexico, for example, currently have the capacity to catch three times the total available stock of shrimp.[281] The fishing industry is so loaded with high-technology equipment that the annual expenditure on fishing is $124 billion to harvest $70 billion worth of fish.[282]

The Alaskan halibut fishery epitomizes the technologically regulated fishery. The FMP for Alaskan halibut limits the season to a few days.[283] Six thousand fishing vessels equipped with complex fishing technology descend on the fishery to participate in this race.[284] During these few days, fishers land over twenty-three million pounds of halibut.[285] Unfortunately, the race is so fast that there is insufficient time to freeze all the landings, causing four million pounds of halibut to rot.[286] The season

---

[276] Litz, *supra* note 266, at 340.

[277] *Id.*

[278] Pearse, *supra* note 101, at 73.

[279] Stutz, *supra* note 119, at 71. An example of high technology fishing includes the use of boats equipped with hydraulic winders that allow small vessels to spread nets up to 1,200 feet long between them. *Id.* Fish schools are spotted from airplanes above and then tracked with echo sounders from the water, and the nets are then closed. The largest trawling nets are capable of simultaneously trapping all fish within an area the size of twelve Boeing 747 airplanes. Tipton, *supra* note 4, at 390 n.62. This technique enabled fishers to land 760,000 pounds of bluefish in ten days in the Chesapeake Bay. Schneider, *supra* note 95, at 32.

[280] *Id.* at 5.

[281] Stutz, *supra* note 119, at 71.

[282] Tipton, *supra* note 4, at 390 (citing Weber, *supra* note 111, at 47).

[283] Tipton, *supra* note 4, at 392.

[284] *Id.* (*citing* Michael Satchell, *The Rape of the Oceans*, U.S. NEWS & WORLD REP., June 22, 1992, at 69).

[285] *Id.*

[286] *Id.*

ends suddenly, and thousands of 100-300 pound halibut are left hanging on hooks to die.[287] This system of management which employs gear and time restrictions has been termed an "Olympic System" because of the derby-style race for fish that the system creates.[288] The technology restrictions and time limitations induce an intense competition for new technology, exacerbating the excessive capitalization of United States fishing fleets.[289] High-technology fishing gear, used frantically in the beginning of the season, must idle after the optimum yield is reached for the fishery. The race becomes so intense that it can present safety hazards to its participants.[290] In the Alaskan halibut fishery, the race for fish is so fast that the boats become quickly overloaded by landings and may capsize.[291] During one season, the Coast Guard received twenty-nine "Mayday" calls from sinking boats.[292] In 1992, the Coast Guard rescued eighty-seven crews from sinking ships fishing in the Alaskan crab fishery.[293] The Olympic System also leads to large quantities of by-catch.[294] Because fishers have no time to discriminate between fish species during a limited season, and because FMPs frequently limit a season to a specific species of fish, fishers discard incidental fish catches.[295] For every pound of shrimp that fishers catch in the Atlantic Ocean or Gulf of Mexico, they incidentally catch nine pounds of red snapper or sea trout.[296] The shrimp industry throws out an average of fifteen million tons of by-catch each year, which frequently results in the death of the by-catch.[297] The regional councils' emphasis on technology restrictions creates a needless waste of fishery resources, contradicting the councils' stated goal of preserving fisheries.

---

[287] Tipton, *supra* note 4, at 392 (citing Leslie Helm, *Reeling in a Fleet Run Amok*, SEATTLE POST-INTELLIGENCER, May 29, 1990, at B5).

[288] Tipton, *supra* note 4, at 383.

[289] *Id.*

[290] *Id.* at 394.

[291] *Id.* at 392.

[292] *Id.*

[293] Tipton, *supra* note 4, at 394.

[294] By-catch refers to fish captured incidentally to the target species. PETER B. MOYLE & JOSEPH J. CECH, JR, FISHES: AN INTRODUCTION TO ICHTHYOLOGY 515 (3d ed. 1996).

[295] Michael Satchell, *The Rape of the Oceans*, U.S. NEWS & WORLD REP., June 22, 1992, at 68.

[296] *Id.*

[297] WEBER, *supra* note 111, at 35. For a discussion of the by-catch harvest, *see generally* ELLIOTT A. NORSE, GLOBAL MARINE BIOLOGICAL DIVERSITY: A STRATEGY FOR BUILDING CONSERVATION INTO DECISION MAKING (1993).

2. Licenses.

Regional councils currently utilize permits and licenses in formulating FMPs.[298] Ostensibly, these devices preserve fish stocks by restricting entry to those fishers who possess the required permits or licenses.[299] Nevertheless, because this solution does not address the common resource problem, it does nothing to prevent the economic incentive that fishers have to deplete a fishery.[300] Although licenses and permits curtail the number of fishers in a fishery, each remaining fisher retains the same incentive to overcapitalize and to overfish.[301] The licensed fishers will increase effort until all the profit in the industry is absorbed, forcing the equilibrium inevitably to point E^c on Figure 3.[302] Additionally, no guarantee exists that the most cost-effective fishers will receive the available permits.[303] Often, councils issue permits on a first come-first served basis, or on the basis of historic catch rates.[304] Thus, prices in licensed fisheries will be artificially high because of the presence of inefficient fishers.[305] The regional councils' use of permits and licenses is economically suboptimal because the policy fails to discriminate between efficient and inefficient fishers and because it fails to address the common resource problem.[306]

3. Subsidies.

Governments evince a peculiar tendency to distribute subsidies to fishers who have depleted a fishery. Subsequent to passage of the Magnuson Act, the United States government subsidized the domestic fishing fleet to further enable it to replace foreign fishing.[307] Federal incentives were devised to build new boats and to install new electronic navigational and fish-finding devices.[308] The government also funded the

---

[298] Loayza, *supra* note 19, at 6.
[299] *Id.*
[300] *Id.*
[301] John, *supra* note 4, at 6.
[302] *Id.*
[303] Dennis D. Muraoka, *Managing the Sea Urchin Fishery: An Economic Perspective*, 30 NAT. RESOURCES J. 139, 148 (1990).
[304] *Id.*
[305] *Id.*
[306] Arnason, *supra* note 8, at 5.
[307] Schneider, *supra* note 95.
[308] *Id.*

research and development of new fishing technology and sponsored technology transfer programs to import foreign techniques on boat design, trawling, and net construction.[309] As a result, vessel construction increased by seventy percent in 1977.[310] Individual fishers, already encouraged to overcapitalize due to the common resource problem, were further induced by the government to invest in high technology equipment.

The United States government subsidized fishers in the chinook and coho fishery which exists off the Pacific coast.[311] After stocks of fish declined by over seventy-eight percent,[312] the fishery was declared a "fishery resource disaster" by the Secretary of Commerce and the fishery was closed.[313] The government responded by granting federal aid to the fishers.[314] Similarly, in New England, the Secretary approved $30 million of relief to New England fishers after a "fishery resource disaster."[315] Subsidies make fishing less expensive for fishers and result in a shift of the total cost curve to the right. From the perspective of Figure 4, subsidies lower the cost of fishing at each level of fishing effort, resulting in a new equilibrium with augmented fishing effort and further depletion of fish stocks. Additionally, the subsidies induce more fishers to join the industry as a result of diminished cost, placing further burden on exhausted fisheries. From the perspective of conservation, government subsidies to the fishing industry are irrational. It is ironic that soon after subsidizing high technology, the government turned to technology restrictions to battle the overfishing problem.

Technology restrictions raise the cost of fishing and move the total cost curve to the left.[316] Government subsidies diminish the cost of fishing and move the total cost curve to the right. These policies are inherently contradictory. While permits and licenses do decrease the number of fishers harvesting in a fishery, they fail to distribute fish to the most

---

[309] Stutz, *supra* note 119.
[310] *Id.*
[311] McManus, *supra* note 166, at 16.
[312] *Id.*
[313] *Id.*
[314] 59 Fed.Reg. 28,838 (June 3, 1994).
[315] McManus, *supra* note 166, at 16. Additional examples of government subsidies to the fishing industry include The Saltonstall/Kennedy Funds, which provided federal funding for market and product development under 15 U.S.C. § 713c-3. The Fishing Vessel Obligation Guaranty Program aided fishers in upgrading the technology of their fleets by backing vessel mortgages with the full faith and credit of the United States. Public Law No. 96-561, 16 U.S.C. § 742c note, 50 C.F.R. pt. 255. McManus, *supra* note 266, at 16. The Fisheries Loan Fund provides direct loans to fishers 60 C.F.R. pt. 250, and tax breaks have been furnished through the Capital Construction Fund. 60 C.F.R. pt. 259. *Id.*
[316] Arnason, *supra* note 8, at 5.

cost-effective fishers.[317] Moreover, none of these solutions address the common resource problem.[318] To curtail the excessive capitalization of United States fishing fleets and to prevent the depletion of fish stocks, regional councils must find a solution to the lack of property rights in fisheries.

V. An Economic Solution to the Common Resource Dilemma

Any viable solution to the overharvesting of fisheries must address the common resource problem. The lack of property rights in commonly owned fisheries induces fishers, inevitably, to exhaust the resource.[319] A rational fisher will not leave fish for future harvests because of the risk that competitors will reap the investment left behind.[320] The intense competition between fishers leads to the overcapitalization of the industry, so that excessive quantities of capital and labor are invested in fishing.[321] The ITQ answers the common resource dilemma. By assigning to individual fishers the right to a fixed quantity of fish, the ITQ eviscerates the common property nature of fisheries.[322] Once fishers have private property rights in fish, the drive to deplete fish stocks and to overcapitalize dissipates.[323]

Section A will analyze in detail the properties of the ITQ and explain how ITQs address and solve the problems inherent in common resource fisheries. Section B will review the success of the ITQ program implemented in the surf clam Fishery, and section C will evaluate the ambitious ITQ program in the international fisheries of New Zealand.

A. *Individually Transferable Quotas*

The emerging fishery management tool that addresses the common resource problem is the ITQ.[324] ITQs create property rights in fish and thereby destroy the common property nature of fisheries.[325] Essentially,

---

[317] *Id.* at 6.
[318] *Id.*
[319] Loayza, *supra* note 19, at 3-4.
[320] Tipton, *supra* note 4, at 382.
[321] Arnason, *supra* note 8, at 5.
[322] Tipton, *supra* note 4, at 397.
[323] Arnason, *supra* note 8, at 5.
[324] Tipton, *supra* note 4, at 397.
[325] Litz, *supra* note 266, at 341-42. Empirical evidence concerning the effectiveness of individually transferable quotas is sparse because few governments have regulated their fisheries with quotas. Even so, marketable permit programs have been used to offset the problems in

an ITQ represents a right to harvest a specific quantity of fish.[326] The managing authority will estimate the optimum yield that fishers may harvest.[327] Then, the authority issues ITQs in a quantity equal to the optimum yield.[328] Normally, the ITQ defines by weight the quantity of fish an individual fisher is entitled to harvest.[329] Sometimes, however, the ITQ grants a fisher the right to catch a specified percentage of the optimum yield for a given fishery.[330]

The method of distribution can be by auction (whereby the government absorbs the economic rent) by historic catch, or by lottery (in which case the fishers take the economic rent).[331] The initial allocation is not especially important, because even if the initial distribution is inefficient, the long run trading of ITQs results in an economically efficient allocation of fishing effort.[332] The more efficient fishers purchase the ITQs from the less efficient ones.[333] This transaction is in the best interest of both the buyer and the seller, because the buyer is willing to pay the seller more for the ITQ than the seller would have yielded by using the ITQ.[334]

The greatest power of the ITQ lies in assigning to each fisher a property right in harvestable fish.[335] A fisher, knowing he or she is entitled to a specific quantity of fish, can confidently leave some fish for

---

other commonly owned resources. Where some type of individually transferable quota has been used, the overall cost of achieving a given environmental standard is minimized. In some cases, the control cost could be reduced by as much as ninety percent by using a marketable permit rather than a command and control approach. TIETENBERG, *supra* note 5, at 40-45. The EPA has created a system of property rights in areas other than fisheries, most notably in the right to buy and sell pollution permits under the Clean Air Act. The cost savings to industry has been estimated to be as high as $12 billion, with no decrease in environmental protection. As part of a program to reduce the amount of lead added to gasoline, the EPA created a system of tradable lead rights that the EPA has estimated to have saved refiners $143 million with no decrease in the level of environmental protection that existed under the old command and control regime. Robert Hahn & Gordan Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 ECOLOGY L. Q. (1989). (For a thorough analysis of how marketable permits such as individually transferable quotas can be implemented to reduce environmental compliance costs, *see* TIETENBERG, EMISSIONS TRADING: AN EXERCISE IN REFORMING POLLUTION POLICY (1985).)

[326] STEPHEN CUNNINGHAM, *supra* note 11, at 169.

[327] Carl McCamish, *Fisheries Management Act 1991: Are ITQs Property?* 22 FED. LAW REV. 375 (1994).

[328] *Id.*

[329] *Id.*

[330] *Id.*

[331] *See* CUNNINGHAM, *supra* note 11, at 171-73.

[332] Pearse, *supra* note 101, at 78.

[333] *Id.*

[334] Litz, *supra* note 266, at 343 n.81.

[335] Tipton, *supra* note 4, at 397.

future harvests.[336] The ITQ system thereby promotes conservation and prevents the otherwise overwhelming drive to overharvest fishery resources inherent in commonly owned fisheries.[337] Additionally, the ITQ system quickly makes excessive fishing capital commercially redundant.[338] Because the fisher is assured of a defined quantity of fish, he or she can spread effort optimally across the entire season, using the most cost-effective configuration of equipment and labor.[339] The quantitative share of the fish harvest thereby eliminates the competitive race for undefined shares implicit in other fishery management regimes.[340] Because the share is fixed, the incentive to invest in the most powerful fishing technology dissipates, and the drive to overcapitalize is restrained.[341]

When regional councils sell ITQs, the councils help ration fish harvesting to those fishers who are most cost-efficient.[342] The prospect of rents leads more efficient fishers to buy the quota entitlements of less efficient operators, and the problem of excessive quantities of labor in fisheries disappears.[343] The unit cost of operation for the fishing industry as a whole decreases, with prices changing favorably for consumers.[344] Additionally, an ITQ system may lower regulatory costs to the regional councils by encouraging fishers to police themselves.[345] Because fishers have a property interest in their ITQs, they have every incentive to conserve fishery resources.[346] By preventing others from cheating, each fisher protects his or her own property interest.[347]

ITQs are transferable between fishers and therefore create flexibility in fishery markets. If a fisher is unable to use the given quota due to equipment failure or illness, the fisher can sell the quota for the season. In a fishery management system with no ITQs, a fisher's illness or equipment failure can lead to a dead loss of profits for the fisher over the season.[348] Additionally, ITQs are useful because they enable fishery

---

336 Tipton, *supra* note 4, at 397.
337 Tipton, *supra* note 4, at 396-97.
338 Wilen, *supra* note 94, at 36.
339 Parzival Copes, *A Critical Review of the Individual Quota as a Device in Fisheries Management*, 62 LAND ECON. 278, 280 (Aug. 1986).
340 Pearse, *supra* note 101, at 76.
341 Loayza, *supra* note 19, at 92.
342 *Id.*
343 Pearse, *supra* note 101, at 76.
344 Loayza, *supra* note 19, at 92.
345 *Id.*
346 *Id.*
347 *Id.*
348 *Id.*

regulators to exert tight control over the number of fish landed.[349] Once the regional council determines the optimum yield for a given fishery, it simply sells ITQs in a quantity equal to the optimum yield.[350] If a council determines the optimum yield for the Pacific coho fishery is one million pounds, it sells ITQs totaling one million pounds. Regional councils cannot accurately achieve optimum yield calculations with the crude tools they currently use. For example, a regional council that decides to reduce landings by one million pounds can only vaguely estimate the decrease in landings that will result from limiting fishers to a maximum of five foot fishing nets.

Economists identify several characteristics essential to the efficient functioning of ITQs. First, they must be transferable, exclusive, and receptive to market forces.[351] Transferability is required so that fishers who cannot competitively harvest fish will be able to sell their quotas to more efficient fishers.[352] Additionally, ITQs should be flexible.[353] Fishers should be able to lease them and borrow against them.[354] The more tradable these quotas are, the more flexible the market becomes. Ultimately, any viable FMP must push the excess fishers out of the market, so that the current problem of excessive labor in fisheries is resolved. That result will occur only where ITQs are fully tradable.[355] Finally, fishers must be confident that their ITQs are stable and permanent property rights.[356] If fishers are convinced that the government will void the ITQs or suddenly close a fishery without honoring existing ITQs, then the quota system will not function properly. Fishers will not buy or sell ITQs if they have no faith in the ITQs' viability, because the same incentive would exist

---

[349] CUNNINGHAM, *supra* note 11, at 217.

[350] Muraoka, *supra* note 303, at 150.

[351] McCamish, *supra* note 327, at 376.

[352] *Id.*

[353] *Id.*

[354] *Id.*

[355] *Id.*

[356] McCamish, *supra* note 327, at 375. Nevertheless, the government has a strong incentive not to define an individually transferable quota as a "property right." If a regional council closed a fishery where outstanding quotas still existed, the action could be considered a "taking" for purposes of the 5th Amendment. The cost of large-scale restructuring of fisheries could become substantial. *Id.* In the surf clam fishery, discussed *supra*, Section V B, the regional councils have the power to set the individually transferable quota level at zero fish, should the fishery become jeopardized. The National Marine Fisheries Service has rejected the idea that individually transferable quotas for clam fisheries represent property rights for 5th Amendment purposes. Litz, *supra* note 266, at 354 n.207.

to harvest fish stocks as quickly as possible before the government closes the fishery.[357]

The surf clam fishery represents the first fishery in the United States to be regulated through an ITQ management system. Part B will therefore critique how effectively the ITQ functions in practice.

B. Surf Clam ITQ

The surf clam fishery is the first fishery in the United States to be regulated through the use of ITQs.[358] This fishery produced empirical data that confirm the theoretical efficacy of ITQs. Heavy fishing of surf clams began in 1970[359] with a maximum harvest of ninety-seven million pounds occurring in 1974.[360] By 1979, three years after passage of the Magnuson Act, overfishing reduced the surf clam harvest to thirty-five million pounds.[361] The regional council promulgated effort restrictions on the surf clam fishery, limiting the time a vessel could fish in a single trip and creating fishing seasons.[362] The effort restrictions proved ineffective in preventing overcapitalization. In 1978, the NMFS estimated that surf clam fishers possessed the capacity to fish two-hundred forty-seven million pounds of surf clams, and that fishers landed only forty million pounds that year.[363] Like many fisheries regulated through effort restrictions, the surf clam fishery was overfished and overcapitalized. The council then turned to ITQs, with the goal of reducing capitalization in the fishery, decreasing the regulatory burden of fishery participants, and stabilizing the stock of surf clams.[364]

Amendment Eight to the Atlantic Surf Clam fishery and Ocean Quahog Fishery establishes an ITQ management system.[365] Under this new system, the regional council calculates the optimum yield of surf clams

---

[357] *Id.*

[358] Litz, *supra* note 266, at 349. The North Pacific regional council has scheduled implementation of an individually transferable quota system for Alaskan halibut and sable fish in 1995. 60 Fed. Reg. 2925 (1995). The South Atlantic Council has created an individually transferable quota plan for wreck fish. Tipton, *supra* note 4, at 386.

[359] Litz, *supra* note 266, at 345.

[360] MID-ATLANTIC FISHERY MANAGEMENT COUNCIL IN COOPERATION WITH THE NAT'L MARINE FISHERIES SERV. THE NEW ENGLAND FISHERY MANAGEMENT COUNCIL, AMENDMENT EIGHT FISHERY MANAGEMENT PLAN FOR THE ATLANTIC SURF CLAM AND OCEAN QUAHOG FISHERY 40 (1989)[hereinafter AMENDMENT EIGHT].

[361] Litz, *supra* note 266, at 346 (citing AMENDMENT EIGHT, *supra* note 360).

[362] 42 Fed. Reg. 60438, 60486.

[363] Litz, *supra* note 266, at 349 n. 147; AMENDMENT EIGHT, *supra* note 360, at 46.

[364] Litz, *supra* note 266, at 349.

[365] AMENDMENT EIGHT, *supra* note 360.

and ocean quahogs fishers may harvest each year, in accordance with the Magnuson Act.[366] The regional council then distributes ITQs in a quantity equal to the total optimum yield.[367] Each ITQ entitles the fisher who owns it to a percentage of the optimum yield.[368] The regional council based the initial allocation of the ITQs on past catch and vessel capacity.[369]

The council monitors the quantity of surf clams that a fisher harvests pursuant to his or her quota through the use of cage tags. Each ITQ comes with an NMFS cage tag which must be attached to the surf clam cages at sea.[370] For enforcement purposes, the tags remain attached to the catch until sold to the processor.[371] The processor keeps the tags until the NMFS collects them.[372] The fishers must maintain log books that show the cage tag numbers used and the quantity of fish harvested.[373] These books are subject to inspection by fishery managers at any time, in accordance with the enforcement provisions of the Magnuson Act.[374] The processors must take possession of the cage tags when they purchase the fish, and maintain them for inspection by the NMFS.[375] These ITQs are fully saleable and leasable between fishers, with a minimum transfer required of five tags per transaction.[376]

The empirical evidence collected so far confirms that ITQ management systems successfully resolve the common resource problem and prevent overfishing and overcapitalization of fisheries. Since implementation of the ITQ program, capital invested in the surf clam and ocean quahog fishery diminished.[377] The number of fishing vessels decreased from 125 in 1990 to 59 in 1992.[378] In addition to resolving the redundancy in capital, the surf clam ITQ program reduced the excess in labor that existed in the surf clam fishery.[379] The less efficient fishers have been pushed from the market, leaving the more cost-effective fishers controlling the industry.[380]

---

366 50 C.F.R. 652.21 (1991).
367 50 C.F.R. 652.20(a)(6)(b).
368 Litz, *supra* note 266, at 349.
369 50 C.F.R. 652.20(a)(1).
370 50 C.F.R. 652.12(b).
371 50 C.F.R. 652.12(a).
372 *Id.*
373 50 C.F.R. 652.6(b).
374 *Id.*
375 50 C.F.R. 652.12(a).
376 50 C.F.R. 652.21(f).
377 Litz, *supra* note 266, at 359.
378 *Id.*
379 *Id.*
380 *Id.*

The total annual catch has remained steady at just under three million bushels per year, indicating that surf clam stocks have stabilized.[381] Finally, dockside enforcement under the ITQ program relies less heavily on expensive enforcement measures like time or technology limitations, so that enforcement costs are significantly lower under the new program.[382]

C. New Zealand Program

The effectiveness of the ITQ management system is further evidenced by the comprehensive ITQ market currently existing in New Zealand. The New Zealand government initiated an ambitious ITQ program in 1987 for thirty-two fisheries within New Zealand waters.[383] Prior to 1987, New Zealand managed its fisheries through traditional effort restrictions, including area controls, gear restrictions, restrictive licensing, and subsidies through capital grants and tax breaks.[384] Unsurprisingly, this policy led to overcapitalization of fishing fleets, excessive labor in fisheries, and depleted fish stocks.[385]

New Zealand reversed its ineffective command and control management by establishing an ITQ system based on the economic principle of assigning property rights to unharvested fish.[386] The New Zealand ITQ represents a valuable property right because it is fully transferable and divisible between fishers.[387] Additionally, this ITQ system is currently preparing for a registration system that would record leases, mortgages, and ownership of ITQs in a central data base.[388]

The New Zealand ITQ management system boldly regulates thirty-two species of fish within New Zealand waters, including most of the commercially significant fish species with the exception of tuna.[389] The initial allocation of fish quotas was made according to the fishers' historic catch and investment in the fishery.[390] At the inception of the program, each ITQ represented a right to harvest a defined weight of fish.[391] The managing authority determined the optimum yield for each fishery and

---

381 Litz, *supra* note 266, at 359-60.
382 *Id.* at 360.
383 Pearse, *supra* note 101 at 77.
384 Wilen, *supra* note 94, at 50.
385 *Id.*
386 *Id.*
387 PEARSE, *supra* note 101, at 77.
388 Wilen, *supra* note 94, at 55.
389 *Id.* at 54.
390 PEARSE, *supra* note 101, at 77.
391 Wilen, *supra* note 94, at 52.

assigned ITQs aggregating the optimum yield amount.[392] If the managing authority decided to change the optimum yield from the initial calculation, it would buy or sell ITQs on the open market until the new equilibrium was achieved.[393] Government purchases of ITQs to lower annual fish harvests proved expensive, and as a result, New Zealand devised a new ITQ that represented a percentage of the optimum yield.[394] Now, when the managing authority lowers the optimum yield of harvestable fish, each ITQ entitles the holder to a percentage of a reduced fish stock.[395]

The results so far show diminished redundancy in fishing capital and improved economic returns on fishing effort.[396] The ITQ system has relieved fishers of the Olympic-style race for fish and allowed them to harvest in a more rational and cost-effective manner.[397] Additionally, the New Zealand government has been able to reduce enforcement costs by relaxing regulations on gear restrictions and closed seasons and decreasing government patrolling of fisheries.[398] New Zealand achieves this by requiring fishers to monitor themselves by maintaining daily location reports and landing logs indicating the quantity of fish caught and the quotas expended.[399] Enforcement has therefore moved from policing fishing grounds to monitoring landings.[400] New Zealand's ITQ system has also improved efficiency in fisheries. Between 1987 and 1992, more than eighty percent of the quota rights in New Zealand fisheries have changed hands at least once, causing more efficient fishers to replace less efficient fishers, and reducing the absolute number of fishers and vessels overall.[401] New Zealand's comprehensive ITQ system convincingly demonstrates that a fishery management regime that creates property rights in unharvested fish resolves the common resource dilemma and creates economic efficiency in fisheries.

VI. Conclusion

The lack of defined property rights in commonly owned fisheries generates a fierce competition between fishers that leads ultimately to the

---

392 *Id.*
393 *Id.*
394 *Id.*
395 *Id.*
396 Wilen, *supra* note 94, at 52.
397 *Id.*
398 PEARSE, *supra* note 101, at 77.
399 Wilen, *supra* note 94, at 51.
400 *Id.*
401 PIERCE, *supra* note 9, at 77.

depletion of fish stocks.[402] Economic forces drive fishers to augment capital and labor resources in an effort to harvest fish before their competitors, resulting in the overcapitalization of the United States fishing fleet, the exhaustion of fishery resources, and the dissipation of all economic rent in each fishery.[403] The result is a cycle of progressively larger fishing fleets expanding their technological sophistication to pursue fish stocks that dwindle further each season.[404]

Current enforcement of the Magnuson Act fails to prevent overfishing because it fails to address the common resource dilemma. The regional councils' use of time restrictions to limit fishing seasons induces fishers to invest in voracious high-technology equipment to land fish within the shortened season and exacerbates the overcapitalization problem. Technology restrictions force fishers to use economically inefficient levels of capital and labor to harvest fish, creating waste within the system while failing to prevent overfishing.

The ITQ answers the common resource dilemma by assigning individual property rights to fishers in unharvested fish. Because the ITQ assures each fisher of a defined share in fishery resources, the ITQ resolves the economic incentive to overharvest and to overcapitalize. Regional councils enforcing the Magnuson Act have already experienced great success with ITQs through regulation of the surf clam fishery. New Zealand's extensive ITQ system provides further empirical evidence of the efficacy of regulating through assigning rights to fish.

The course for regional councils is clear. The Magnuson Act provides regional councils with the tools and authority to regulate fisheries and to enforce optimum yield calculations. Regional councils should establish an ITQ system for each fishery they regulate under the Magnuson Act, assuring that each ITQ represents a fully tradable and transferable property right. The councils should then enforce an optimum yield calculation that is sufficiently low to allow exhausted fish stocks to recover and to permit high sustainable yields for future seasons. Once the stocks have recovered, the optimum yield should be set at the economically efficient level of fish harvesting utilized in the privately owned fishery. This quantity of fish harvesting occurs where the marginal cost and marginal benefit of fishing are equal, represented by point E^e on Figure 2. The regional councils should then allocate ITQs in a quantity equal to the optimum yield. Through trade of these fishing rights, the ITQ system will

[402] John, *supra* note 21, at 4-5.
[403] Tipton, *supra* note 4, at 382.
[404] John, *supra* note 21, at 4.

force out of the fisheries the inefficient fishers as well as the commercially redundant capital. The problems generated by the common property nature of fisheries will be resolved through assigning to fishers property rights in unharvested fish. Fish stocks will recover and the fishing industry will finally achieve an economically efficient level of fish harvesting and capital investment.