Individual Fishing Quotas:

Environmental, Public Policy, and Socioeconomic Impacts

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Front cover photograph
Kodiak Town Harbor with fishing boats
Kodiak, AK
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I. Executive Summary

Recent scientific reports have detailed declines in various indicators of ocean health, and ocean fisheries in particular have received much attention. One study found that 90 percent of large, predatory ocean fish have disappeared from the world's oceans in the last 50 years[1]. These declines have had considerable impact both on marine ecosystems and on fishermen[2] and consumers who rely on those ecosystems for economic benefit and sustenance. Overfishing and mismanagement of U.S. fisheries have left many federally-managed fish populations depleted. The fishing industry is struggling, coastal fishing communities are struggling, and there is growing evidence about the broader adverse impacts to marine ecosystems.

One system that is increasingly being promoted in fishery management as the preferred means to restore profitability to fishing and health to ocean fisheries is the use of Individual Fishing Quota programs or IFQs[3]. IFQs grant an opportunity to fish for a fixed percentage of the total annual quota of a fish species to individual fishermen or fishing businesses. Proponents claim that IFQs reduce overcapitalization (the number of fishing vessels in a fishery), promote conservation, improve market conditions, and promote safety. Critics charge that IFQs create disincentives for conservation, consolidate ownership, limit new entrants into the fishery due to the high cost of quota shares, increase management costs, and create a range of negative socioeconomic impacts including loss of employment in coastal communities and inequitable distribution of initial allocation of quotas.

IFQs are currently used in four U.S. fisheries and in several fisheries in other countries. Research into these programs reveals both positive and negative impacts. Experience suggests that IFQs reduce overcapitalization, for example, but often do so at a cost to small family fishermen and coastal communities. Likewise, the evidence is mixed on conservation benefits. A recent General Accounting Office study details the "delicate balancing act" that managers must walk between economic, environmental, and social costs and benefits in implementing IFQs[4]. For precisely this reason, Congress enacted a moratorium on new IFQ programs from 1996-2002 and mandated further study of IFQs before new IFQ programs could be enacted in the U.S..

The purpose of this paper is not intended to set out arguments for or against IFQs. Nor is it intended to compare IFQ programs with existing management schemes. The purpose is to identify the negative impacts associated with current IFQ programs that have been identified by researchers in U.S. and foreign IFQ-managed fisheries, learn from those mistakes, and make recommendations to avoid them if such programs are to be implemented in the future.

Many of these findings were noted by the National Research Council's (NRC) Congressionally-mandated review of IFQs[5]. The NRC found many positive features of IFQs as well. It is certainly possible for these issues to be dealt with by the regional fishery management councils in designing programs, as suggested by NRC. However, empirical evidence of significant conflicts of interest on the councils raises serious questions about the councils' ability to make the hard choices necessary to satisfy the competing criteria of IFQs[6]. Instead, given the breadth and depth of potential problems associated with IFQs, Congress should enact national standards governing IFQs to prevent these problems. Such standards would preclude IFQs from becoming property rights, ensure conservation is enhanced through strict standards and regular independent review, and protect family fishermen and fishing communities.

The numerous and significant impacts detailed in this paper can be reduced or eliminated by enactment of federal legislation containing national standards for IFQ programs. Here are some impacts highlighted in the review:

Public Trust Impacts

- IFQs can be used to privatize publicly-owned fishery resources.
- IFQs create wealth before fish are caught, making it more difficult to incorporate management changes because of the additional money involved.
- Under IFQs, management costs increase and are often not fully recovered.

Environmental Impacts

- Overfishing in the form of exceeding the total allowable catch can still occur under IFQs.
- IFQs can increase bycatch because fishermen often keep only the most economically valuable fish (this is known as highgrading).
- Because quota shares are allocated for individual species, IFQs can be inconsistent with ecosystem-based management.

Socioeconomic Impacts

- IFQs tend to consolidate quota into the hands of larger fishing firms often to the detriment of small family fishermen.
- Because of consolidation of quota, IFQs eliminate jobs, disrupt fishing communities, and eliminate fishing traditions.
- IFQs generate windfall profits and increase profitability for a select few "winners;" the resultant re-distribution of wealth is often inequitable.

II. Introduction to IFQs

Ocean fisheries face enormous problems with declining catches, habitat destruction, overfishing, overcapacity, and wasteful practices. For example, in the west coast groundfish fishery, the capacity to catch fish outpaced the reproductive capacity of the fish. To address this situation, the federal government in 2000 declared the west coast groundfish fishery a "disaster," and as a result, large area closures were instituted and hundreds of fishermen were put out of work. The problems continue: Nine groundfish species are listed as overfished and scientists estimate that it will take decades for their populations to recover. Industrial-scale fishing trawlers have destroyed an unknown amount of ocean-floor fish habitat. Individual fishermen have lost jobs, and revenues to coastal communities have declined precipitously. The cumulative impacts to marine ecosystems are unknown.

Some have posited that this "tragedy of the commons" is reversible through privatization of ocean resources[7]. Others have shown that mismanagement of ocean resources by the regional fishery management councils is at fault[8,9]. Still others blame poor scientific data for poor management.

In response to these problems, Congress passed amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) in 1996 to end overfishing, rebuild overfished stocks, minimize wasteful fishing practices that catch and kill non-target ocean wildlife, and identify and protect important ocean and coastal fish habitats. The 1996 amendments, called the Sustainable Fisheries Act, provided the regional fishery management councils and federal managers in the National Oceanic and Atmospheric Administration's Fisheries Service (NOAA Fisheries) with specific guidance to accomplish these goals. The Sustainable Fisheries Act also placed a moratorium on new individual fishing quota (IFQ) programs because of concerns with the impact of such programs on both fishermen and the marine environment. IFQs, Congress dictated, required further study to determine their potential costs and benefits.

IFQs grant exclusive access to fish a certain percentage of the total allowed catch of a species of fish or shellfish in a specific area within a specified time. IFQs reduce competition between fishermen for fish (the so-called "race for fish") because each fisherman in an IFQ program is apportioned a certain percentage of fish that can be caught at any time during the fishing season[10]. This is a change from current fisheries management, which prescribes specific fishing seasons and vessel limits. This flexibility is cited as critical to improving safety (fishermen do not have to fish in bad weather or overload their vessels to maximize landings), creating more revenue for fishermen, and delivering fresh fish to markets and restaurants for longer periods of time.

IFQs are generally transferable, that is, fishermen or fishing businesses can buy, lease, or sell their shares. For example, a fisherman could purchase additional quota of a particular fish and catch more fish during that season. Such transferability is cited by proponents as critical for ensuring that market forces eliminate inefficiencies in any particular fishery. The theory is that by allowing individuals and firms to transfer quota in this manner, inefficient operators will increase their efficiency or sell their quota[7]. Proponents claim that through the combination of exclusive access and transferability, fishermen and fishing businesses will become more economically viable. In addition, proponents claim that because the value of quota shares is linked to the environmental health of the fish resource, fishermen will become better stewards of those resources.

IFQ programs have been implemented in only four U.S. fisheries: in 1990 for the surf clam/ocean quahog shellfish fishery in the mid-Atlantic, in 1992 for the wreckfish fishery off the south Atlantic, and in 1995 for the halibut and sablefish fisheries in Alaska. New Zealand and Iceland use IFQs in nearly all of their fisheries, Canada and Australia use IFQs in several fisheries, and Greenland and the Netherlands use IFQs in some fisheries.

From October 1996 until October 2002, Congress placed a moratorium on the establishment of new IFQ programs due to concerns with the impact of such programs on both fishermen and the marine environment. It also mandated a rigorous review of IFQs by the National Research Council (NRC). After extensive research on IFQs, including public hearings in the eight fishery management regions of the U.S., the NRC published *Sharing the Fish: Toward a National Policy on Individual Fishing Quotas* in 1999. The NRC recommended lifting the moratorium on IFQs, but also identified a number of significant negative impacts of IFQs found in fisheries in the U.S. and around the world. While the NRC recommended giving latitude to the regional fishery management councils to address some of these issues, it also recommended that Congress act

to address other issues through amendments to the MSA. Many fishing and conservation groups called on Congress to adopt national standards to address negative impacts. Congress did not act to pass such legislation and, at the behest of one of the original authors of the MSA, the moratorium was extended until October 2002. That moratorium has expired, no national standards have been passed, IFQ programs are under development in the Gulf of Mexico red snapper fishery, and talks are underway in the Pacific for a groundfish IFQ program.

Examinations demonstrate that IFQs reduce capacity and unrestricted quota trading helps promote economic efficiency as less efficient fishermen either improve efficiency or sell their quota[5]. Yet, this efficiency can come at a cost to small family fishermen and coastal communities, in both inequitable initial distribution as well as overconsolidation. IFQs also push the envelope of privatizing public resources. IFQ proponents claim that by giving fishermen a long-term interest in fishery resources, they will be better stewards of the resource. Examinations of IFQs, however, demonstrate both positive and negative impacts to marine resources. The following examination of the literature is intended to outline the negative impacts of IFQs that have been identified by researchers in U.S. and foreign IFQ-managed fisheries so that we can avoid them in the U.S.. For a closer look at the mixed results of IFQs, see the box "Alaska's Halibut IFQ Fishery" below.

Alaska's Halibut IFQ Fishery

Initial quota allocation sought to maintain a heterogeneous fishing fleet:

- Quota shares were granted based on participation in the fishery over three years, not just one, allowing various interests to be considered in the fishery[11].
- Allocation limits exist across vessel type and size categories and the shares may only be traded within their respective categories. Furthermore, an amendment to the program allows small-boat operations to fish with large-boat quotas[5], making it easier for small boats to persist in the fishery.
- Shares are further subdivided among geographic regions[5], allowing all coastal communities the ability to reap the economic benefits of IFQs.
- In the Aleutian Islands and Bering Sea, between 20% and 100% of shares in specific regions were set aside for rural native communities in the form of Community Development Quotas[11].
- However, quotas were only granted to boat owners, not crew members, a contentious issue that still riles fishery managers and coastal communities[5].

Some conservation benefits developed:

- A study by the International Pacific Halibut Commission estimates that fishing mortality from lost and abandoned gear dropped from 554.1 metric tons in 1994 to 125.9 metric tons in 1995[5].
- The total allowable catch, which was frequently exceeded before the implementation of the IFQ program, has not been exceeded since[5].
- Because shares are subdivided among regions, it follows that area-specific stock depletions will not occur. However, there have been no biological studies to confirm this hypothesis[5].

Fleet safety increased:

- The IFQ program allowed the fishing season to extend to 245 days from under 5 days. The extension allows fishermen the liberty of choosing when to fish so they do not have to fish in bad weather or compete in derby-style races. Since the implementation of the program, the longline vessel accident rate has fallen[12].

Economic benefits may have increased:

- The extended fishing season may also account for the rise in ex-vessel halibut prices. However, this has not been effectively proven[5].
- For seven years, taxpayers paid for the administrative costs of the program while NOAA fisheries developed a shareholder cost-recovery system. In 2002, the government was able to implement the new system and start collecting fees from quota holders.

III. Public Trust Impacts

Property Rights?
In the MSA, the U.S. claims "sovereign rights and exclusive fishery management authority over all fish and all continental shelf fishery resources, within the exclusive economic zone[13]." The central concept in fisheries management is that the living and non-living resources of the ocean belong to all U.S. citizens. Like the national forests and parks, the ocean and its resources are managed for the public by a federal agency, in this case NOAA Fisheries and the regional fishery management councils. Like those other resources, the oceans, especially its fisheries, have tremendous value. In 2002, total commercial fisheries landings were valued at $3.1 billion[14]. The American Sportfishing Association set the total 2001 economic output of saltwater sportfisheries at $31 billion[15].

In fisheries management, IFQs are commonly referred to as "rights-based management" regimes because they assign exclusive access to a portion of the overall catch to an individual fisherman or business. This exclusive access has been claimed by proponents to represent a "property right[7]." Others refute this claim, noting that the MSA specifically negates any potential ownership of publicly-owned ocean resources[16,17,18].

One of the central arguments of rights-based management proponents is that such management will set up an efficient market where costs will be minimized and economic benefits maximized[7]. Furthermore, proponents claim privatization leads to better stewardship of resources and helps to sustain fish species in the long run[7]. However, many economists agree that the arguments wielded by these proponents are based on arbitrary assumptions and theories that may prove false in real world scenarios[5,19,20]. Moreover, the claims surrounding enhanced stewardship of resources are widely questioned[5,16,21,22]. As the NRC observed, "Much of the political support for IFQs is … driven by faith in the assumption that privatization will foster ecological sensibility[5]."

While it is clear that the MSA prohibits IFQs from becoming private property[17], there is ample evidence asserting that IFQs, as they have been implemented, take on the appearance of private property rights[5,19,20]. Indeed, many IFQ proponents argue that such rights are necessary for full realization of the benefits of IFQs[23]. Copes (2000) notes that "a fishery committed to an IFQ program is a fishery whose fish stocks are unlikely to return to publicly-owned resource status[24]." Squires *et al.* (1995) envision an even more permanent status: "[t]he inherent permanency of perpetual property rights and the difficulties of revoking them due to vested interests probably insures the permanency of ITQs [individual transferable quotas] when they have been implemented[25]." In Iceland, for example, quota shares in the groundfish fishery, while theoretically the property of the nation, "are acquiring the characteristics of private property, *despite legal clauses to the contrary*[5]." (emphasis added) In New Zealand, quota shares are held to be property rights by owners. Only with a Court of Appeal decision in 1997 did the court invalidate the claim that quota represented an "absolute" property right[22].

> *"Is it necessary to convert public assets into private assets in order to solve current fisheries management problems? The experience of the U.S. suggests that the answer is an emphatic no."*
>
> Seth Macinko and Tim Hennessey
> *Managing Marine Fisheries in the U.S., 2002*

Macinko and Hennessey (2002) raise the question regarding the "appropriate public policy process for making a decision on such a conversion in ownership[18]." In detailing the history of privatized natural resources in the U.S., researchers have found that such a transfer of ownership is not necessary to solve current fisheries management problems[16,18].

One area of speculation surrounding the implementation of IFQs has to do with the potential for quota holders to bring legal action against the government for compensation should the value of quota decline after management action. In New Zealand, for example, the fishing industry filed suit following the government's reduction of the total catch[22]. The NRC put it plainly: "… although IFQs are limited privileges and may be legally revocable, political pressure from permit and quota shareholders concerned about protecting their investments will resist revocation … this is evidenced in other natural resource sectors, such as mining and ranching, when reduction in privileges of access to public resources are challenged by those who benefit from them[5]." Whether or not the MSA can withstand such challenges remains to be seen (especially in

fisheries that become overfished and quota reductions are required). The NRC determined that additional amendments were necessary to the MSA in order to prevent such claims: "The Magnuson-Stevens Act should be amended to make it clear that the nature of the privilege embodied in an IFQ … does not authorize actions by IFQ shareholders against federal, state, or local governments for actions designed to protect marine resources and the environment…[5]."

In the words of McCay (1995), "tradable, exclusive rights to take a proportion of a defined quota are quite clearly property, as underscored in their treatment as such for tax purposes in Iceland, the U.S. and other countries. Whether *de jure* or *de facto*, something like private property emerges in ITQ systems [where quota is granted in perpetuity][21]."

One final aspect of the debate around property rights, and perhaps the most troubling to taxpayers, involves the issue of "gifting." In all existing IFQ programs, the initial allocation of quota has been awarded without charging the recipient for the use of public resources[5,21]. Such "gifting" of public resources in the U.S. "has not been seen since the Homestead Act of 1872, and flies in the face of existing U.S. policy on a host of other natural resource issues[26]." This initial allocation of free quota shares creates a windfall to the initial recipients. Later entrants have to pay to gain quota and have to pay those from whom they buy quota, not the government. Such an arrangement lends to the conclusion that IFQs "amount to a giveaway of public resources[21]." Copes (1997) adds: "[Windfall gains] have often caused discontent not only among subsequent holders of purchased licenses and quotas, but also among the general public, scandalized by the inequitable disposition of benefits from a public resource. To many, this gift may seem particularly inappropriate in the case of large and financially sound fishing corporations[19]." While windfall gains represent troubling public policy, this has not prevented American and foreign countries' employment of them. Researchers have noted that windfall gains are needed to ensure the cooperation of current participants[19,20].

Impacts to Fishery Management

IFQ proponents claim that IFQs ameliorate several challenges facing fishery managers, including adherence to the total allowable catch (TAC). The theory holds that since each fisherman is guaranteed a fixed share, fishermen will only catch their share, thus eliminating overages. Once an IFQ program is established, however, adapting to changing conditions and incorporating management changes are often more difficult because IFQ programs often treat fish as private property. For example, reductions to allowable catches will likely be highly contested by quota owners because such reductions diminish not only the value of the current season's catch but also a loss of asset value for loans[22,25]. Quota owners also have an increased economic incentive to exert pressure on managers to ensure that the TAC is maintained or increased even when managers may be lowering the TAC for long-term public interest[22,27]. As Wallace (1998) notes: "TAC … setting is prone to strong industry pressure for the elevation of catch limits or resistance to catch reductions[22]." Furthermore, add Monk and Hewison (1994), "Political pressure has led to the setting of TACs at levels beyond maximum sustainable yield[28]." In New Zealand, for example, the government tried in successive years to reduce the TAC for the northern red snapper stock to allow it to rebuild. "Industry responded with a series of legal injunctions to prevent TAC reductions and to gain compensation from the government should reductions be allowed[22]." The Court of Appeal eventually dismissed industry's claims that their property rights were absolute and that the government had no ability to change the TAC.

> *"ITQ management appears to have been assessed by economists primarily interested in terms of increased gross resource rents, with insufficient weight or attention given to the economic costs of monitoring, enforcement, resource assessment, discards, and social costs to form a measure of net social benefit."*
>
> Dale Squires, James Kirkley, and Clement A. Tisdell
> *Reviews in Fishery Science, 1995*

Another researcher makes a simple analogy: "[m]anagers should consider Murphy's Law: Anything that can go wrong will. Issuing perpetual rights makes things hard to fix[29]." IFQ programs can also be extremely costly to change once they are in place[27]. In New Zealand, for example, early revenues from ITQ programs often went to compensate ITQ holders when the TAC was lowered[28]. The implication of compensating quota owners is sobering: Such costs can effectively prohibit managers from adjusting TACs downward because the potential compensation to quotas holders would be high. In

reviewing New Zealand's Quota Management System (QMS) after eight years, Monk and Hewison (1994) found that "the threat of large compensation claims by quota holders against the New Zealand government has acted as an impediment to reductions in TACs in some major fisheries. There appears to be a clear example of this occurring in the orange roughy fishery on the Chatham Rise, where the government has continued to set a TAC at nearly three times the scientifically recommended MSY (maximum sustainable yield)[28]."

In addition to making management adjustments more difficult, IFQs significantly increase the costs of management. IFQs are often more expensive than alternative management systems due to their dependence on highly accurate stock assessments, extensive enforcement, and more highly trained staff[5,25,30]. Many IFQ systems have failed to either recover fees adequate to cover management and research costs[5,25], and most fee collections provide minimal cost recovery[5].

New Zealand's history is instructive. First, the government tried to recover the costs of management and research through "resource rents" applied to users. According to Wallace (1998), "The resource rental revenue … always returned less than fishery management and research costs[22]." Second, at industry's request, the government implemented a cost-recovery system where industry would pay 70% of management and research costs. In 1992, the government expected to generate "NZ$53 million annually … [yet] only levied about NZ$33-36 million in cost recovery charges[22]." Industry pressure to reduce contributed costs in New Zealand has hit research budgets especially hard[22]. The potential downside of cost recovery systems in New Zealand, and elsewhere, is the "capture by the industry of fisheries management at the expense of other users[22]." Furthermore, in New Zealand, "Industry has tended to consider its rights as pre-eminent in any dispute with other stakeholders such as recreationalists or environmental organizations … [C]ost recovery has strongly reinforced this view…[22]."

In addition, researchers have observed that the more complex the fishery, the higher the costs of an IFQ system[24,29]. Seasonal changes, different vessel quotas, and overlapping jurisdictional boundaries all lead to higher management, monitoring, and enforcement costs[25]. In order for appropriate TACs to be set at the beginning of each season, IFQ systems require increasingly accurate and frequent stock assessments[25]. IFQs move fishery managers to focus almost exclusively on stock assessments, to the exclusion of broader environmental assessments[22]. For example, in New Zealand, "environmental organizations' attempts to widen the research agenda from fisheries stock assessment to environmental assessment … have had very limited success[22]."

> *"Since quotas are fixed and excessive catch is a violation of the law and subject to prosecution, a quota shareholder tends to land only the portion of the catch that generates the highest income."*
>
> National Research Council
> *Sharing the Fish, 1999*

Monitoring and enforcement are critical in IFQ systems: only with full compliance does industry reap expected benefits[5,25,26,31]. In addition, IFQs potentially create incentives to cheat by underreporting catches and highgrading by keeping only the most economically valuable part of catches[5,20,32,33,34], increasing enforcement costs. The basic reason: fishermen and fishing businesses will seek to get the most value for their quota. McCay (1995) cites the changeover to a non-competitive system as the reason for these incentives: "[U]nable to compete for an undetermined amount under a generalized quota or other regulatory system, the ITQ holders have incentives to try to get more than allowed[21]." Thus, monitoring and enforcement costs are driven up to ensure the efficacy of IFQ programs.

In the Netherlands, the government is moving away from IFQs due to high management costs[12]. In Alaska's halibut and sablefish fisheries, increased dockside monitoring and enforcement requirements have increased management costs[12]. For example, Buck (1995) observed: "NMFS estimated that increased monitoring and enforcement costs to cover additional landing ports and vessel observers for the halibut and sablefish IFQ program would be approximately $2 million annually, to counter high-grading and bycatch concerns, and deal with the large fleet and area covered[12]." Monk and Hewison noted that New Zealand's "system is difficult to enforce and monitor[28]." Buck (1995) also noted on a broader level that "larger ITQ programs will likely require an extensive enforcement effort and the number of violations could be substantial[12]." Given the limits in the MSA to cost-recovery (3% of the ex-vessel value of landed fish), such issues are highly germane. In its recommendations on this issue, the NRC suggests that this "may well be too low for some IFQ programs and should be increased[5]."

IV. Environmental Impacts

IFQ proponents argue that as resource rights move from public to private hands, better stewardship of the resource follows. This is based on the theory that when no one owns the fish there is motivation for each fisherman to fish as much as possible, as quickly as possible, so he or she can catch the maximum amount before the fishery limit is reached each season. Proponents argue that once fishermen own the fish they are catching, they will not need to race their peers in order to catch the most fish. Instead, they will reap the benefits of fishing over a longer period of time if the fish resources remain healthy, which will create an incentive for them to maintain the fish populations' health. Even though traditional economic thought followed this line of thinking for decades, many economists have seen little empirical evidence of an improved conservation ethic in IFQ fisheries[26,28,36].

IFQs = Enhanced Stewardship?

IFQ supporters can point to some successes of IFQ programs: namely more efficient fish markets. An efficient market exists when a fisherman is making the most money for the smallest effort put into catching the fish. Nonetheless, Squires *et al*. (1998) note, "Simply instituting an ITQ program will not, however, ensure that potential gains in efficiency will arise[20]." The theoretical case for IFQs is "highly dependent on gross simplifications imbedded in the implicit or explicit assumptions which remove the ITQ model from the real world of fisheries[19]."

For example, proponents claim that implementing ownership rights will lead fishermen to maintain the health of the resource for years to come. The assumption that fishermen will fish at a sustainable rate runs contrary to what is called "the iron law of the discount rate." If a fishermen can earn more money by selling a fish today than by allowing it to stay in the ocean another week, he or she will catch it and sell it today[36].

In such situations, as the history of U.S. natural resources depletion has shown, it is optimal for the individual owner to exploit the resource as quickly as possible and invest the proceeds where they will grow faster than the regeneration rate of the exploited stock[36]. In the U.S. wreckfish fishery, Gauvin (1994) found that "the hoped for market incentive that would induce stock conservation had less impact than originally expected" because the discount rate – the desire to earn more money faster – outstripped the conservation incentives[34].

IFQs are Inconsistent with Ecosystem-based Management

IFQ programs work by dividing up percentages of the total annual quota of a single-species of fish among the fishermen in a fishery. IFQs, like existing single species management, apportion these quotas without regard to how catching those fish will affect the rest of the ecosystem. Unlike existing single-species models, however, re-configuring quota allocations to account for such ecosystem impacts will be harder to do as quota value increases. Recent reviews of the U.S. fishery management system, like that of the Pew Oceans Commission, call for ecosystem-based management because it is the only way to maintain healthy oceans, fish populations, and fishing communities[37,38,39]. Rieser (1999) notes the difficulty of managing "a large number of individuals with the same incentives" to ensure that "all of the interconnecting components of a functioning ecosystem remain intact[27]."

In New Zealand and Nova Scotia the single-species IFQ programs fail to address broader ecosystem considerations[28,40]. Wallace (1998) points out that IFQ management "…has intensified the stratification of fisheries management into single stock management[22]." Monk and Hewison (1994) note that New Zealand's system "focuses primarily on single-species management and largely fails to address broader ecosystem considerations[28]." In both, a fish quota of one species is traded to cover the bycatch of another species. Although this may help limit bycatch, it does not take into consideration the health of the population of the bycatch species. Thus, the overall balance of the species in the ecosystem is disregarded[26].

Furthermore, the challenge to ecosystem-based management increases because the only products in the ecosystem that have economic value are the fish sold at market. Some economists find that there is no incentive to protect the ocean habitat because no one, including the fishermen, has to pay for destruction that has no dollar value assigned to it[20,27,41]. When a factory worker accidentally breaks a machine, the factory owner has to pay for a new machine or the factory will not be able to continue producing at the same pace. In contrast, if a trawl runs over a coral bed and destroys the spawning ground of a grouper, no one pays for the destruction of the spawning ground even though the grouper's production level drops over time.

An IFQ program requires that the health of a fish population must be determined before the start of the season so each fisherman's quota can be set for the year. However, ocean conditions and fish populations are always in flux. Even the best scientific population predictions may change during a fishing season. IFQ researchers note that fishery management lacks the ability to adjust the TAC downward once it has been set in place[19] (see Public Trust Impacts section). Such inflexibility prohibits managers from acting with precaution in situations where the TAC may not represent adequate protection for specific fish populations.

> *"IFQs are not a conservation tool, they're mainly an economic tool to control overcapitalization and 'the race for fish'. The TAC and other management measures are the main conservation tools in IFQ systems."*
>
> National Research Council
> *Sharing the Fish, 1999*

Bycatch, Discarding, & Highgrading

All fishery management schemes suffer from the ecological and economic problems created by bycatch, which is the catching of unwanted fish and other ocean wildlife that leads to overexploitation and ecosystem damage. Scholars who support IFQs argue that quotas, which create incentives to maintain fish populations, help alleviate these problems. However, not only does bycatch remain a problem in IFQ programs, but also it can be intensified or new problems can be created by the incentives formed in quota programs[20,21]. In New Zealand, for example, Monk & Hewison note that, "Bycatch and underreporting continue to be major problems[28]."

> *"The original theorists of ITQs probably did not envision the degree to which incentives to cheat, discard, or highgrade catch might influence the behavior of fishermen."*
>
> John Gauvin, John M. Ward, and Edward E. Burgess
> *Marine Resource Economics, 1994*

Highgrading, price dumping, and underreporting are all outcomes of quota systems and not of traditional management systems. In fact, because quotas grant fishermen the privilege to catch the fish and not ownership rights to the fish themselves, the conservation benefits may not exist at all[5,20,25]. The privilege to catch fish will motivate fishermen to maximize the value of their quota, not to maintain the sustainability of the fish population that they do not own.

In order to maximize the quota value and each catch associated with it, fishermen may be motivated to throw back lower-value fish. Bycatch known as highgrading occurs when higher-value fish are kept for sale while the lower-value fish are thrown back to sea, often dead[5,19,26,35,42,43,44]. Through highgrading a fisherman can maximize the dollar value of his or her catch while disregarding the adverse effects of this bycatch to the overall ecosystem. The NRC reported that "[d]iscarding of small and immature fish during fishing operations and highgrading the catch seem … to continue to be serious problems in the Icelandic fishery and these problems may have been escalated with ITQs[5]." In addition, highgrading has been documented in fisheries for Atlantic Canadian groundfish[45], inshore Newfoundland cod[45], northern New Zealand snapper[46], Australian southern bluefin tuna[47], and the New Zealand multi-species ITQ program[20,48,49]. Dewees (1990) observed that "New Zealand's … ITQ experience reveals multispecies fisheries problems with high grading, discards, total allowable catch overruns, and total allowable catch underruns[48]." McCay (1990) additionally notes that "ITQs do not solve the problems [bycatch, joint catch] of multispecies fisheries management and may intensify some of them[49]."

Similar to highgrading, quotas create an incentive for price dumping, which is the discarding of fish due to changes in ex-vessel price. If a fisherman is on his or her way back to dock and hears that the price of the fish has dropped, he or she may throw the fish overboard in order to fish the allowable quota on another day when prices may be higher[19]. In management schemes where fishermen can fish without a quota, there is no incentive for them to throw back fish they could otherwise sell, even if the price drops. In this way, the limits imposed by quota shares encourage increased bycatch mortality.

Furthermore, underreporting of catch, known as data fouling and quota busting (exceeding quota share) may be more prevalent in IFQ systems[20,25]. Gimbel (1994) notes that quotas create an incentive for fishermen to underreport so they can maximize their quota value[26]. In detailing the data fouling associated with Iceland's IFQ program, the NRC noted that fishermen who accidentally land cod while fishing for haddock "must acquire an equivalent amount of cod ITQs to cover their catch to prevent loss of their fishing licenses. … this results in considerable amounts of dead fish being thrown back to sea, especially toward the end of the fishing year when ITQs are scarce and the lease price is inordinately high. ITQs may, therefore, contribute to the waste of living resources, resulting in the erosion of ecological responsibility[5]." Underreporting, like the type that occurs in Iceland, undermines catch calculations and can cause TACs to be set too high[26]. Muse and Schelle (1989) note that data fouling is one of the main problems in the Ontario freshwater ITQ program[45], and it is also observed in the U.S. IFQ wreckfish fishery[34].

"The way in which an IQ system works gives fishermen a clear incentive to high-grade their catches leading to unreliable fishing mortality data."

Stephen Cunningham
The Use of Individual Quotas in Fisheries Management, 1993

Examples of IFQ Fishery Failures

Contrary to economic efficiency and biological conservation arguments that proponents wield, fishery collapses have taken place in IFQ systems. The New Zealand snapper fishery suffered depletion due to overfishing through highgrading, misreporting, and increases in quota shares over the initial allocation[28,46]. Wallace's (1998) examination of all the New Zealand fisheries under IFQ management found them lacking: "In 1998, of the 187 stocks managed under the quota system, 25 had stock assessments. Of these, 13 were below the biomass that would support maximum sustainable yield[22]."

"Much of the political support for ITQs is … driven by faith … that privatization will foster ecological sustainability."

National Research Council
Sharing the Fish, 1999

After surveying the collapse of multiple New Zealand fisheries, Monk and Hewison (1994) warn fishery managers to "critically examine its [ITQs] present deficiencies" before implementing future programs. Their review of IFQ programs found fishery failures under IFQ management in the orange roughy, rock lobster, and snapper fisheries in New Zealand[28].

Back on this side of the globe, Canada's east coast cod and groundfish populations suffered similar declines. After 10 years under IFQ management, the fisheries collapsed. For five years the Canadian government closed down the fishery. Copes (2000) notes that this was the first ever "massive and multiple collapse" along Canada's Atlantic coast[24].

In sum, IFQs do not eliminate existing environmental problems and can actually exacerbate them. Reviewing 11 years of IFQ management in New Zealand, Wallace (1998) concludes: "The capacity of the New Zealand quota management systems to achieve environmental goals has not been demonstrated[22]." Monk and Hewison (1994) speak more broadly to the environmental impacts of IFQs: "… IFQs are not a panacea for long-term conservation of fisheries."

V. Socioeconomic Impacts to Fishermen and Fishing Communities

The objectives of IFQ programs focus on conservation, economic efficiency, and safety. Proponents generally fail to address socioeconomic impacts: the impacts to fishermen and fishing communities. Squires *et al*. (1995) note that "there are real social costs of ITQ management that must be factored into evaluations, although these are inevitable costs whenever market economies widen and deepen to incorporate sectors not formerly and predominately governed by markets[25]." Yet, the NRC notes that "the extensive literature and testimony received indicate that insufficient attention and resources have been devoted to socioeconomic impact assessments prior to decisions about IFQs[5]." The following discussion outlines some of the real social costs.

Consolidation of Quota – Disenfranchisement of Small Family Fishermen

The starting point for many of the social and economic problems associated with IFQs is the tendency for IFQ systems to allow for a concentration of quota shares[21,24]. Additionally, IFQs tend to encourage large-scale interests to dominate a fishery and for small family fishermen to be bought out of the fishery[31,50,51]. Hand in hand with concentration of quota is the transfer of market power to those fishermen with large quota shares and the resultant ability to then manipulate quota and product prices to the detriment of others[31,52]. McCay (1995) adds that, "Generally, in ITQ systems, power will be transferred to ITQ holders, reducing the negotiating power of those who work for them[21]."

Numerous examples of quota consolidation exist in IFQ programs. A 1999 study of the surf clam and ocean quahog fishery showed that many small firms sold out in the first two years after implementation of the IFQ program and by the late 1990s significant consolidation had occurred[5]. A General Accounting Office (2002) review, however, found that an even greater consolidation had occurred: "Consolidation of surf clam and ocean quahog quota is greater than NMFS data indicate, because different quota holders of record are often part of a single corporation or family business that, in effect, controls many holdings. For example, for 2002, we determined that consolidation of quota in the surf clam program was about twice that indicated by NMFS data and that one entity alone controlled at least 27 percent of the quota[53]."

In the Icelandic fisheries, concentration of quota shares with fewer and bigger companies has accelerated where there are multiple fisheries under IFQ management. Twenty-four large firms own almost half the total quota; a decade earlier these same firms owned only a quarter of the total[5,54]. Survey research in New Zealand found a pronounced decrease in quota owners, suggesting a rise in quota held by remaining participants[51]. McCay (1995) also found a "rapid concentration of ownership in ITQs … the groundfish fisheries of the Scotia-Fundy district of Canada[21]." Even IFQ systems with ownership restrictions struggle with overconsolidation[21]. In New Zealand, limits on the amount of quota one fisherman or firm can own are 20 percent for inshore and 35 percent for offshore fisheries; nevertheless, the owned and leased quota-holdings of the 10 largest companies in New Zealand increased from 58 percent to 66 percent over a 10 year span (1986-1988)[31]. In the Alaskan halibut IFQ program, small family fishermen's quota holdings decreased through the 1995-2003 period, while larger vessel owners' quota holdings increased[55].

> *"From a social cost-benefit standpoint the question needs to be asked whether the improved private profitability of the enlarged company operations will be able to offset the diseconomies suffered in smaller communities with a shrunken economic base. The latter will include the effects of job losses, reduced aggregate incomes, shrunken business turnover, reduced scale economies and service levels, higher unemployment, outmigration, assets lying waste, requirement for additional infrastructure in receiving communities of migrants, etc."*
>
> Parzival Copes
> *Social Implications of Quota Systems in Fisheries, 1997*

Impacts to Small Coastal Communities
The consolidating nature of IFQs affects family fishermen and fishing communities in numerous ways. The impacts of consolidation and concurrent disenfranchisement of small family fishermen are felt most strongly in coastal fishing communities. The National Research Council (1999) analyzed this impact: "To some extent, regional concentration of quota shares is unavoidable, a healthy sign of increased economic efficiency. The social costs, however, may outweigh the gains in economic efficiency. As was the case when agriculture became increasingly intensive and took advantage of gains to scale, negatively affecting traditional farming communities, some fishing communities will undoubtedly thrive, whereas others' valued life-styles and traditions will be threatened[5]."

Researchers have documented numerous adverse socioeconomic impacts: job losses, reduced aggregate incomes, higher unemployment, rupture of personal relations, loss of professional expertise and knowledge, loss of a traditional fishing culture, and wider income gap between quota "haves" and "have-nots[19,21]." In Iceland, municipal bankruptcy in fishing villages that have lost most, or all, of their quota along with massive unemployment and dissolution of communities is of great concern[5,54]. Another concern is the loss of fishing employment and decrease in revenues and the impact on coastal communities' economic and social stability.

IFQs have also initiated a geographical shift of power from rural to urban centers. McCay *et al*. (1995) reported a clear geographical shift in both the surf clam/ocean quahog fishery as well as the Canadian programs they examined[56]. In Iceland, the main accumulators of quota are companies in larger towns[5].

"The fact that an ITQ program will produce aggregate benefits means there is a potential to make everyone better off. In practice, it is difficult to attain such fine-tuned fairness."

Rögnvaldur Hannesson
Global Trends: Fisheries Management, 1997

In reviewing a decade of IFQ management in the Icelandic fisheries, one researcher asked the following question: "[s]hould the closedown of whole communities, leaving the residents unemployed and with worthless houses be treated as an 'externality' of the ITQ-system, a part of the price to be paid for efficiency in the fisheries[54]?"

"IFQs as currently administered, do nothing to produce income for U.S. citizens, who are the owners of the wealth of ocean fisheries."

Daniel Bromley
Managing Marine Fisheries in the US, 2002

Initial Allocation of Quota Shares
Initial allocation of quota shares is replete with problems. The process itself is lengthy and requires a substantial investment of management resources[25]. In the Alaska halibut and sablefish fisheries, for example, implementation of an IFQ system took eight years to complete[11]. The process is also likely to be contested by those excluded from the initial allocation[27]. This has been the case in the Alaska halibut and sablefish fishery as well as the New Zealand fisheries. A 1997 survey of quota holders in the Alaska halibut fishery found that nearly two-thirds thought that the IFQ systems did not allocate quota fairly[57].

A major issue associated with initial allocations is the determination of who is eligible to receive quota. Generally, vessel owners are eligible[5]. Yet, such a determination is widely criticized in the U.S. and elsewhere. The decision to allocate only to vessel owners in the Alaska halibut and sablefish fisheries sparked wide opposition from crew and skippers. In *Alliance Against IFQs v. Brown*, the Ninth Circuit Court found that the plaintiffs had valid concerns but the lack of a legal basis in the Magnuson-Stevens Act, and the limited review afforded under the arbitrary and capricious standard of the Administrative Procedures Act, foreclosed any opportunity for relief[27]. In Iceland, for example, prior to IFQ programs, fishing was typically regarded as a "co-venture" of vessel owners and crew, and many crewmembers now feel disenfranchised[5]. In 1998, the Iceland Supreme Court ruled that initial quota allocations deprived a majority of the population access to an equitable share in the publicly-owned resources of the ocean[58].

Crew and skippers who have as long a track record as boat owners themselves are generally left out of the initial allocations and many lose their jobs[19,27,59]. Conversely, those who remain may suffer reduced incomes, as was the case in the Nova Scotia small trawler fishery[56]. IFQs also create significant barriers to entry or upward mobility for fishermen, especially for crew, small-scale fishermen, or economically distressed fishermen due to the high cost of purchasing quota[60]. Additionally, because of the considerable cost of quota shares and reduced number of vessels, few crewmembers can expect to become vessel owners[19,21,25,51]. Copes (1997) posits that with IFQs, highly skilled skippers and crew (called highliners) "may remain at the top of the skill hierarchy, but with the lower demand for labor in the fishery and the smaller post-rationalization difference between highliners and marginal fishers, the highliners are likely to find the returns to their skills reduced. Highly skilled hired skippers and crew members are likely to lose income in the process[19]." Casey *et al.* (1995) noted that highliners in the British Columbia halibut fishery "tended to receive quota allocations significantly less than their previous derby landings and vessels with sporadic catch history received relatively more quota[61]."

"...limits on transferability can help maintain the viability of communities, regions, or ethnic groups by retaining asset ownership and employment within these social groupings."

Dale Squires, James Kirkley, and Clement A. Tisdell
Reviews in Fishery Science, 1995

Another major issue with initial allocations has to do with the wealth created in the initial allocation. The windfall financial gains conferred upon the initial participants creates an immediate gap between quota "haves" and "have-nots[19]." Such a gap can significantly reorganize social relations in small communities[62]. The initial windfall gains can also create discontent in the public at large to the inequitable disposition of benefits from a public resource, especially if those gains initially or eventually end up in the hands of large and financially sound fishing or processing corporations[5,19,26]. Australia has attempted to curtail these effects, utilizing criteria to "avoid or minimize redistribution of wealth[63]."

A final problem with initial allocations is that they are generally based on recent catch history, i.e., the amount of fish a fisherman has caught during a specified period of time[5]. In systems where there are no limits, such allocations reward the biggest fishermen, those with the largest capacities in the selected years win. In some cases, these could be the very fishermen that caused environmental problems in the fishery in the first place.

In Australia, the courts found that such an allocation process was capricious and irrational[5]. In that program and others, initial inequities continue to provide major obstacles to establishing satisfactory management regimes[5,19]. A corollary issue is known as "fishing for quota," where speculation that an IFQ program is coming leads fishermen to fish hard to develop large catch histories, increasing pressure on fish populations.

VI. National Standards for IFQs

As noted earlier, the purpose of this paper was not to set out arguments for or against IFQs. The purpose was to highlight the negative impacts of IFQs that have been identified by researchers in U.S. and foreign IFQ-managed fisheries. The numerous and significant impacts detailed in this paper can be greatly reduced or eliminated by enactment of legislation containing national standards for IFQ programs.

The Marine Fish Conservation Network worked with conservation groups, commercial and recreational fishing associations, and marine science organizations over the past several years to develop a set of national legislative standards that will not prevent regional councils from enacting IFQs, but will work to prevent the worst aspects of IFQ programs from harming family fishermen, marine ecosystems, and the public trust.

The standards outlined below are spelled out in more detail in H.R. 2621, the "Fishing Quota Standards Act of 2003," introduced by Representatives Allen (ME), Delahunt (MA), and Simmons (CT).

Fishing Quota Standards Act of 2003 (H.R.2621)

Negative Impact	**How H.R. 2621 Eliminates or Mitigates**
IFQs take on the appearance of property rights	The bill retains current law stating that IFQs are not compensable property rights and are revocable. Additionally, the bill strengthens this principle by limiting IFQ programs and shares to a period not to exceed seven years, after which time they *may* be renewed subject to satisfying defined criteria.
Threatening the public trust	The bill requires Councils and the Secretary of Commerce in developing IFQ programs to take into account the fair and equitable distribution of a public resource. The bill requires IFQ programs and shareholders to return scientifically measurable improvements in avoiding bycatch, preventing highgrading, reducing overfishing, rebuilding overfished stocks, and protecting essential fish habitat. The bill requires independent review of IFQ programs and shareholders through a national IFQ review panel, consisting of individuals knowledgeable about fisheries management. In addition, each fishery management council will establish and maintain an IFQ review committee, consisting of individuals with knowledge in fisheries management to conduct reviews of IFQ shareholder performance.
IFQs increase management costs	The bill requires that the total amount collected from all quota shareholders is sufficient to recover direct costs related to administration and implementation, including enforcement, management, data collection, and scientific research.
IFQs consolidate quota	The bill generally limits quota shareholders to owning no more than one percent of the total allowable catch with an exception of five percent if a council can demonstrate that such an increase will not be detrimental to other shareholders. Exceptions for fisheries with a small number of participants are provided.

(Continued on next page)

Negative Impact	How H.R. 2621 Eliminates or Mitigates
IFQs do not eliminate bycatch, discarding, and highgrading	The bill rewards fishermen with past conservation-based performance by including conservation performance criteria for the initial allocation process. This criteria seeks to include fishermen who have used selective fishing practices that have minimal bycatch, prevent highgrading, and have minimal adverse impacts on essential fish habitat. The bill requires IFQ programs and shareholders to provide additional conservation benefits in the form of scientifically measurable improvements in avoiding bycatch, preventing highgrading, reducing overfishing, rebuilding overfished stocks, and protecting essential fish habitat. The bill creates incentives in successive allocations for fishermen who fish selectively and protect essential fish habitat to obtain increased allocations.
IFQ have numerous negative impacts on coastal communities	The bill contains language requiring any IFQ program to minimize, to the extent practicable, negative social and economic impacts of the program on local coastal communities.
IFQs allocate quota unfairly	The bill requires a fair and equitable allocation of quota shares among vessel categories and gear types. Additionally, preference in initial allocations is given to fishermen who are currently engaged in fishing and have long-term participation in the fishery. The bill also requires the approval of a two-thirds majority of the fishermen in the fishery to begin development of an IFQ program. Last, the bill requires a second referendum to approve a specific IFQ program, requiring a two-thirds majority of fishermen and crewmembers.
IFQs exclude crew and skippers	The bill requires that crew members who derive at least 75 percent of their income from the fishery be included in the referendum to approve a specific IFQ program.
IFQs eliminate new entrants	The bill requires that IFQ programs set aside a portion of each annual-allocation for new entrants, including entry-level fishermen, small vessel owners, and crew members.

While these standards cannot eliminate all problems associated with IFQs, they can reduce some of the worst effects of poorly regulated IFQs. The extensive literature detailed in this paper sets out concerns detailed by research completed on IFQs from Alaska to New Zealand. IFQs present significant threats to public ownership, the ocean environment, and the socioeconomic well being of fishing communities, and good government is needed to protect the taxpayer, marine ecosystems, and family fishermen and fishing communities. As Grafton (1996) notes, "ITQs are not … a panacea for all the problems that arise in fisheries[31]."

Recognition of the limitations of IFQs and proactive action on the part of Congress can ensure that IFQ programs promote conservation and protect small family fishermen and the coastal communities who depend on them.

Congress has the opportunity to address the problems identified in this paper; we can learn from the mistakes of others.

VII. Endnotes

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(2) Instead of using the terms fisher and fishers, the use of the term "fishermen" is used throughout this paper and is intended to be gender-neutral.

(3) Throughout this paper, the use of the term individual fishing quota refers inclusively to individual transferable quotas (ITQs) as well. Quota systems can exist without the ability to transfer quota from one owner to another, in fact, existing management schemes have such systems. IFQ proponents generally argue for transferability and much of the literature addresses the impacts of quota systems with transferability.

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(23) Many rights-based management proponents argue that in order for effective stewardship to materialize, private property rights in fish, the marine environment, and ultimately in management itself must be transferred. See Scott, A. 2000. Moving through the narrows: from open access to ITQs and self-government. In: Shotton, R (ed.). Use of property rights in fisheries management.Rome, Italy: Food and Agriculture Organization of the United Nations. Fisheries Technical Paper 404/1. and Scott, A. 1993. Obstacles to fishery self-government. *Marine Resource Economics* 8(3): 187-199.

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