Sustaining America's Fisheries and Fishing Communities

AN EVALUATION OF INCENTIVE-BASED MANAGEMENT

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CAP

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Executive Summary

THE CURRENT STATE of America's fisheries is clearly unacceptable. Fifty-four stocks are classified as overfished, 45 stocks are experiencing overfishing and just over half of the nation's stocks remain in an uncertain status. Due to declining stocks and lost fishing opportunity, more than 72,000 jobs have been lost in the Pacific Northwest alone. The typical fisherman now makes nearly 30% less than the average male American worker and his job is 35 times more dangerous. Despite decades of management, fisheries and fishing communities are still suffering. Something is wrong and must be changed.

It is commonly agreed that, to be well-managed, a fishery needs:

- A catch limit — a scientifically-determined, fully enforced limit on the total number of fish caught and landed
- Controls on bycatch — the unintentional killing of fish and other ocean life
- Conservation of important marine habitat

Yet the conventional fishery management system has proven unreliable in protecting fish or fishermen in the United States, even when these three components are present. This failure is a fundamental consequence of trying to manage fisheries as a commons. In a commons, where shares of the catch are not specified, each fisherman's economic survival is predicated on his ability to fish as hard as possible whenever possible.

As stocks (predictably) decline, this dynamic often plays out in a spiral of depletion and economic failure. Fishermen deploy excessive amounts of capital and fishing effort in order to catch dwindling numbers of fish, resulting sometimes in the collapse of entire fishing fleets.

But the tide is turning. This study shows that we can simultaneously protect the environment; increase profits; provide higher quality fish; create more full-time jobs; and save lives. The crucial missing ingredient is the inclusion of economic incentives as a key feature of fisheries management.

Innovative, incentive-based tools are emerging that align the economic interests of fishermen with ecological and safety concerns. These tools, similar to other modern public resource management systems, are variously known as "catch shares" or "Limited Access Privilege Programs" (LAPPs). They are the final puzzle piece to saving our fisheries and fishing communities.

Catch shares work by allocating a dedicated percentage share of a fishery's total catch to individual fishermen, communities or associations. If a fishery is well managed, the value of these shares increases as the stock expands. When participants have a secure portion of the catch, they

gain the flexibility to make business decisions that improve safety, enhance the value of their asset and promote healthy fishing stocks.

This idea is not new. But until now, there had been no comprehensive, data-driven study to measure its effectiveness in recent years. With seven federal fisheries under catch share management, and several more under consideration for catch shares at the beginning of this study, clearly a need existed to assess performance and provide guidance going forward.

To fill that void, Environmental Defense assembled a team of 30 specialists. They reviewed more than 150 papers and studies; collected data on nearly 100 U.S. fisheries; performed in-depth analysis of the 10 existing U.S. and shared stock U.S.-Canadian catch share fisheries; and conducted field work in three existing catch share fisheries, as well as two others contemplating a transition. [A detailed methodology is included as Appendix D of this report.]

"Sustaining America's Fisheries and Fishing Communities" was a 14-month, $1.2 million project undertaken by Environmental Defense in partnership with the Gordon and Betty Moore Foundation. A key member of the team was the Redstone Strategy Group, who performed quantitative evaluations of the industry as a whole, as well as each existing catch share program. Redstone brought to the table objective, cross-industry, global expertise in market-sector research. In addition, Professor Lawrence White of New York University conducted a comparative analysis of public resource allocation processes (see Appendix A).

This project documents how catch share fisheries in the United States and British Columbia perform against key environmental, economic, and social goals since converting from conventional management to catch shares.

CATCH SHARES: TRULY IMPRESSIVE RESULTS

- **Catching within limits** — All catch share fisheries have catch limits and compliance rises dramatically. In fact, on average, landings were 5% below the cap.
- **Improved science and monitoring** — Nearly three-quarters of catch share fisheries have monitoring, compared to just one-quarter of non-catch share fisheries. Biomass estimates were significantly more precise.
- **Reducing bycatch** — Bycatch was reduced by more than 40%, which, together with the benefits from complying with catch limits, each year saves the equivalent of the annual seafood consumption of 16 million Americans.
- **Limiting fishing impact on habitat** — catch share fisheries deploy 20% less gear to catch the same amount of fish; less gear in the water likely results in reduced habitat destruction. All of the catch share fisheries also make use of ecosystem protection tools like time or area-based closures.
- **Safety** — Under catch shares, safety more than doubled, based on an index of vessels lost, lives lost, search and rescue missions and recorded safety violations.
- **Economic performance** — Revenues per boat increased by 80% due to higher yields and dockside prices.

Despite all their benefits, however, catch shares do change the business of fishing.

For example, job stability markedly improves under catch shares. But the nature of those jobs changes. Averaged over a year, a typical crew position before catch shares would have provided the equivalent of just one-half day of work per week. Afterwards, that potential rose to more than four days of work per week. But this welcome increase in full-time employment has

consequences; the total number of available crew positions decreased by half.

Similarly, while major concentrations in fleet ownership did not result from catch share programs, the viability of some small-scale operators and ports may indeed be reduced as fishing businesses adapt.

Fortunately, as we discuss in this report, the careful design of catch share programs can mitigate these transition costs, and the substantial new value generated by catch shares makes it possible to do so.

Over the years, observers have questioned the necessity and utility of incentive-based fisheries management. This report responds to those questions, and, we believe, demonstrates that aligning fishermen's economic incentives with society's conservation goals is indeed a powerful, effective and desirable policy outcome.

Simply put, when well-designed catch shares are added to the fisheries management mix, environmental damage decreases significantly and economic performance increases substantially. As such, it's not surprising that fisheries with catch share systems are seven times more likely than conventional systems to be rated "well managed" by the Marine Stewardship Council's independent third-party certification process.

RECOMMENDATIONS

IMPLEMENT CATCH SHARES

Catch shares, when well-designed, are a key component in successful fisheries management and should be implemented more widely in order to build sustainable fisheries and vibrant fishing communities.

ENSURE ROBUST AND EFFECTIVE DESIGN

Educate stakeholders on catch share programs and options. Stakeholders should draw on this detailed body of knowledge regarding design elements, frequently encountered barriers and successful strategies to create catch share systems that maximize benefit and minimize transition costs for their fisheries.

Improve efficiency of design process. Program design should be done by small groups of representative stakeholders with clear instructions from state and federal managers as to goals and timetables for decision-making. Another critical element is credible conflict-of-interest standards for members of the design committee.

Prioritize funding for catch share design process. In light of their ability to help fisheries meet multiple objectives, funding should be prioritized to implement catch shares. In addition, we recommend exploring ways to tap improved fishing economics through public-private financing initiatives.

INVEST IN THE FUTURE

Some of the increase in value created by catch shares should be reinvested in the fisheries and fishing communities. New revenues can help run catch share systems; improve data collection; achieve the social objectives of particular communities; or increase the levels of monitoring, enforcement and research.

EMPLOY THOROUGH REVIEW AND ADAPTATION PROCESSES

Catch share programs must be adaptive. They need to have strong regular reviews in order to regularly improve performance and address any new issues that may arise. This requires updated science as well as a robust process for addressing necessary management changes.


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Introduction

AMERICANS are enthusiastic seafood consumers. From fish sandwiches to gourmet wild Alaskan salmon, we eat close to five billion pounds of seafood a year, putting the United States third in global consumption behind Japan and China.[1] But our love of seafood has consequences.

In November 2006 newspapers across the country featured a cautionary tale. According to a report in the journal *Science*, several of the world's leading marine biologists concluded that, in a worse case scenario and with continued bad practices, all fish and seafood species worldwide would crash by 2048.[2] Whether this and similar conjectures come true depends on how we respond to the demonstrated biological and economic decline of fisheries.

Many fisheries are in trouble. For example, worldwide, it has been estimated that 90% of species of large predatory fish are already gone.[3] Domestically, 54 stocks are classified as overfished, 45 stocks are experiencing overfishing and just over half of the nation's stocks are in uncertain status due to lack of science.[4,5]

America's fishing communities are also suffering. The collapse of the iconic cod fishery in New England in the early 1990s cost an estimated 20,000 jobs.[6] An estimated 72,000 jobs have been lost due to decreasing salmon stocks in the Pacific Northwest.[7]

The demise of fisheries and fishing communities has come despite decades of effort to better manage our fishery resources. But in the process, we have learned what is truly needed to manage fisheries sustainably. A fishery needs:

- A catch limit — a scientifically-determined, fully enforced limit on the total number of fish caught and landed
- Controls on bycatch — the unintentional killing of fish and other ocean life and
- Protection of important marine habitat

Despite this knowledge, implementing and adhering to these bottom-line requirements has proven a daunting challenge. However, we have identified the missing puzzle piece and can offer some good news for the future:

The key missing ingredient for successful, sustainable fisheries is a management tool that can align fishermen's economic incentives with conservation goals: Catch shares, also known as Limited Access Privilege Programs (LAPPs).

Catch shares, as the name implies, dedicate a share of the annual catch to an individual fisherman (in the form of Individual Fishing Quotas), groups of fishermen (in the form of a cooperative or sector), or a community (in the form of Community Quotas).

LAPPs can also be geographically-based, dedicating a specific area for management by an individual, group or community.[8]

The findings in this report conclusively demonstrate that fisheries under catch share management perform better against a wide range of key performance indicators — from economic gains for fishermen and fishing communities, to environmental goals like catch limits, bycatch controls and habitat protection.

Finally, the report examines how fishery allocations compare to other public resource management systems; describes a design tool that can help decision makers implement LAPPs more effectively; and offers a series of recommendations for moving forward.

While the opinions expressed in this paper are solely those of Environmental Defense, the report draws heavily on findings from a recently-completed quantitative study conducted by the Redstone Strategy Group, LLC (Redstone), which was commissioned by Environmental Defense and completed in partnership with the Gordon and Betty Moore Foundation. See Appendix D for a full discussion of this report's methodology.

Professor Lawrence White of New York University conducted the comparative analysis of public resource allocation systems (see Appendix A).

How Catch Shares Differ from Conventional Management

AS RECENTLY as the 1960s marine fisheries were largely unregulated. Many people believed fish to be limitless ocean resources. When Julius Stratton, then-chairman of the Ford Foundation, and other members of the first national ocean commission released their report in 1969, they urged the expansion of the U.S. fishing fleet in order to achieve the perceived nearly limitless untapped economic opportunities in fisheries.[9]

Concurrently, the global fishing fleet expanded, moving closer to the United States and angering fishermen, particularly in New England and Alaska. In response Congress passed the Magnuson-Stevens Fishery Conservation and Management Act (MSA) in 1976, expanding federal jurisdiction of fisheries from 12 to 200 miles offshore.[10]

The MSA also included important conservation, economic, and regional management elements. It was designed to "take immediate action to conserve and manage the [U.S.] fishery resources;" to "promote domestic commercial and recreational fishing;" and to "establish [eight] Regional Fishery Management Councils" that gave the industry a voice in management matters.[11]

If the pre-MSA era was a time of open, unfettered access to U.S. fisheries, the three decades since have been marked by increasingly strict rules. Limitations on fishing effort and access, including vessel and gear restrictions, area closures, and days-at-sea constraints, have all forced fishermen into a competition with each other and with regulators.

When regulators shortened the fishing season, fishermen responded by increasing fleet size and using more powerful engines. This triggered further cuts in the season, prompting fishermen to put out more hooks, lines and nets, leading to further cuts in the season, and so on. In some fisheries, like Alaskan halibut, the annual commercial fishing season was ultimately reduced to just 48 intense hours.[12] The "race for fish" was on.

Fishing day and night to maximize their catch in the limited time allowed, fishermen deploy thousands of extra hooks and lines. Fouled gear is simply cut adrift, where the hooks continue to "ghost fish" for months and years. Less selective gear is used, and the tonnage of discarded bycatch (both commercial and noncommercial species) surges. The fishermen exceed catch limits and fish populations suffer.

This "tragedy of the commons"[13] encourages dangerous, economically wasteful and environmentally damaging fishing. The fishermen are caught up in seasonal derbies. They feel compelled to go out in dangerous weather for fear of losing their catch to competitors.

Regulators also attempt to control fishing through "effort" controls, such as the allowable size of boats and engines, accepted gear types, and daily or monthly trip limits. Fishermen and

regulators are thus pitted against each other in a game of "cat and mouse."[14] The fishermen continually and creatively find new ways to catch more fish while staying within the rules regulators have laid out.

Capacity in the fishery skyrockets; now there are significantly more boats and gear trying to capture the fish than would be necessary if the fishing were being pursued in a more rational way. Not only are fishermen competing against each other, but they (and processors) are investing significantly in capital goods that may sit idle for much of the year. The inevitable result is declining catches per boat, increased costs to fishermen and declining revenues.

In a few cases, conventional approaches alone have helped bring back individual fish stocks. The North Pacific has avoided the worst results: Fisheries are sustainable and profitable. In 2005, six rebuilding stocks, including Bering Sea crab, have recovered and six more fisheries saw overfishing end in recent years.[15] Redfish in the Gulf of Mexico are on the rebound after managers placed a moratorium on commercial fishing. However, the moratorium lasted 10 years and imposed numerous costs on fishermen, and four species were newly classified as 'overfished' by NOAA Fisheries in 2005.[16]

So there is some good news. It shows that we can indeed recover damaged fisheries. However, these gains are coming much too slowly and at too high a price.

There ought to be a better way. And there is.

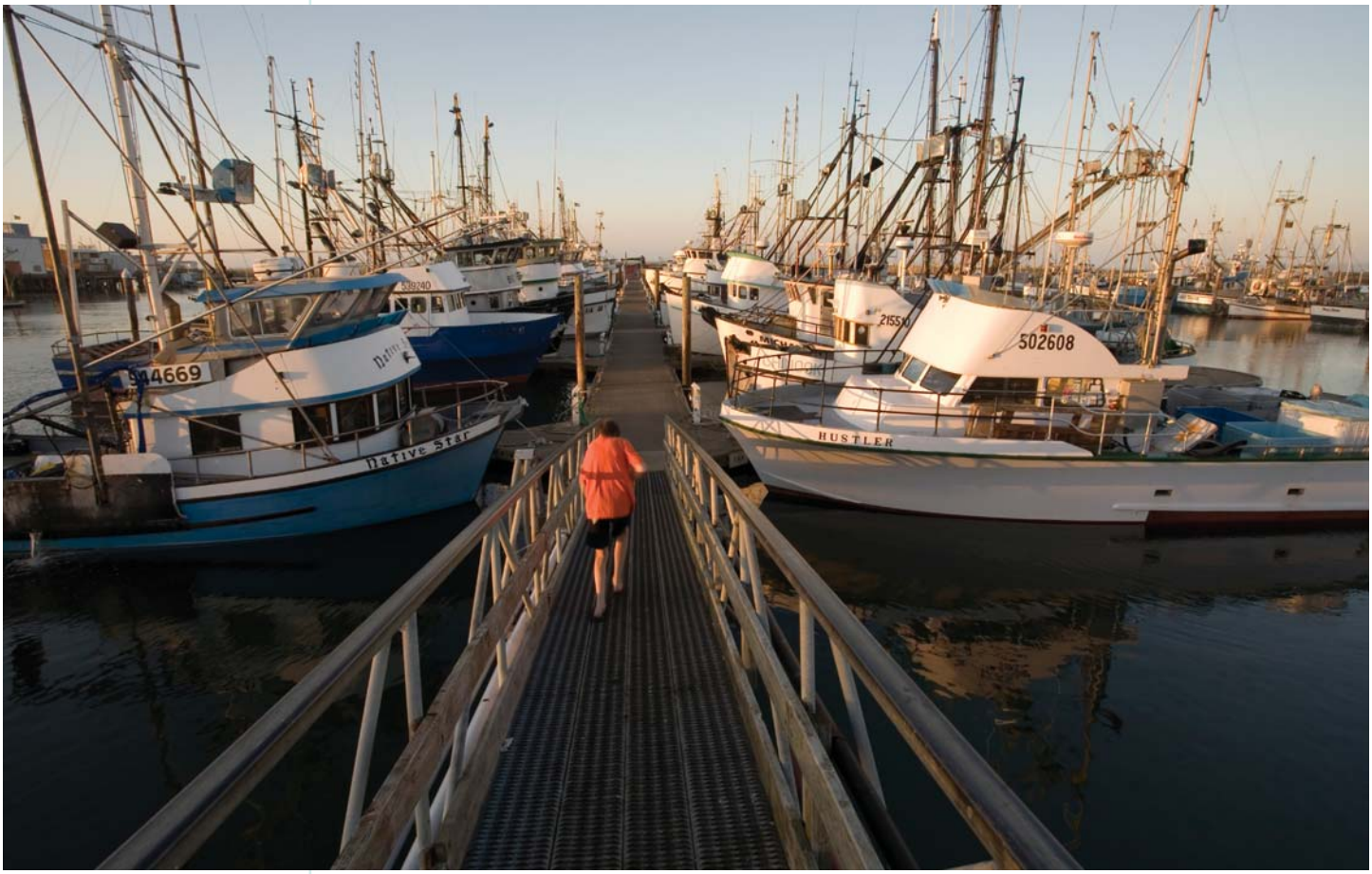
SOLVING THE COMMONS PROBLEM

Fisheries are not alone in the challenge of managing a commons. There is a rich history in the United States of policy approaches to public resource management, from water to the electromagnetic spectrum. Commonly, policy makers have implemented a system in which users are granted exclusive privileges to use a resource, subject to specific rules and conditions of use. These conditions have proven effective in achieving policy goals, though they have also proven challenging to amend as goals change over time. Existing users have generally been given preference in the allocation of privileges. In the past, many such private privileges have been granted freely, but today there is movement towards capturing more value for the public, through auctions or use fees. [A more complete discussion of public resource allocation policies can be found in Appendix A.]

MSA UPDATE

In late 2006 Congress finalized a rewrite of MSA. This is the first such action by Congress to improve fisheries management since 1996, when the Sustainable Fisheries Act amendments made critical advancements for restoring depleted fisheries. However, the 1996 amendments also established a moratorium on all catch share systems for fisheries, which stalled progress towards fishery reform, until the moratorium was lifted in 2002.

With broader recognition today that catch shares can improve both fishery conservation and economics, the updated MSA includes new rules for their implementation, including regular monitoring and reviews of the program, cost sharing, a ten-year review and renewal cycle for shares, and a process for initiating LAPPs within the regional fishery management councils.[17]



CATCH SHARES: IMPROVED ECONOMIC, ENVIRONMENTAL AND SOCIAL PERFORMANCE

Beginning in the 1970s, initially in Australia, New Zealand and Iceland, a new fisheries management approach began to take hold, known as catch shares or Limited Access Privilege Programs (LAPPs). LAPPs work by dedicating a secure share of fish to an individual fisherman, community or fishery association. Allocated as a percentage share of the annual catch limit, fishermen know exactly how much fish they are allowed to take in advance of the season.

Furthermore, most catch share systems allow trading so that fishermen can buy and sell shares in order to maximize their profit. For instance, if shares on the market are cheaper than a fisherman's costs to capture the fish, he will purchase additional shares. If it is more expensive to capture fish than to sell a share, then the fisherman will sell. This helps drive the fishery to an efficient and sustainable level, and rewards innovative fishermen who can lower costs and deliver a quality product that will fetch a good price on the market.

With a secure share of the catch, fishermen no longer need to race. And with a direct stake in the overall health of the fishery, the incentives shift from maximizing volume to maximizing value.

As the fishery moves towards a more efficient level, capacity is reduced and seasons expand. With a slower pace of fishing, fishermen can more effectively plan their season, reducing the amount of gear deployed, reducing bycatch, delivering fish when the market demands and staying ashore in unsafe conditions. With catch levels controlled, regulators are able to relax many of their previous effort constraints.

The early motivation for LAPPs was a desire to promote safety and improve economic performance. Yet soon evidence of environmental and other social improvements under LAPPs began to mount, corroborating theoretical projections. It turned out that by dedicating fishermen a

share of the catch, LAPPs overcame the "tragedy of the commons," providing a clear economic rationale for resource conservation.

In much the same way that shareholders in a company want the business to excel so their shares gain value, fishermen in LAPPs need sustainable fisheries in order for their shares to appreciate. Landing and discarding unmarketable species, such as bycatch, or spending time deploying excess gear are costly for fisherman. Under catch shares, they have a way to avoid such additional costs. Furthermore, if fishermen exceed their share of the catch, they have to pay to buy additional quota on the market. If no quota is available, stiff penalties often ensue.

Environmental gains materialized even though the early LAPP programs weren't designed with environmental benefits in mind; they included no additional environmental restrictions. Reducing costs, avoiding penalties, and engaging in other practices that improved conservation simply and finally made good business sense.

In addition, LAPPs provided more secure, full-time jobs and alleviated the substantial stress and instability of short "derby" fishing seasons.

Despite these benefits, however, LAPPs have not been without challenges. Any fundamental change in the way a business operates is bound to meet some resistance, particularly among those who gain the most from the conventional approach.

Some are concerned that LAPPs privatize public fisheries resources.[18] Difficult questions arise about resource allocation, trading rules and transition assistance, as well as the ability to appropriately monitor catch share programs. In the United States in particular, finding ways to understand and address these challenges has been muddled by a lack of scientific data and a reliance on anecdotal information.

At the beginning of this study, seven federal fisheries operated under LAPP management in the United States. With several more fisheries under consideration for LAPPs, clearly a need existed to assess the performance of these programs to date and provide guidance going forward. This study was designed to fill those needs.

Measuring Catch Shares Against Key Fisheries Management Objectives

1. COMPLYING WITH CATCH LIMITS

All LAPP fisheries have catch limits and compliance with the limits is extremely high.

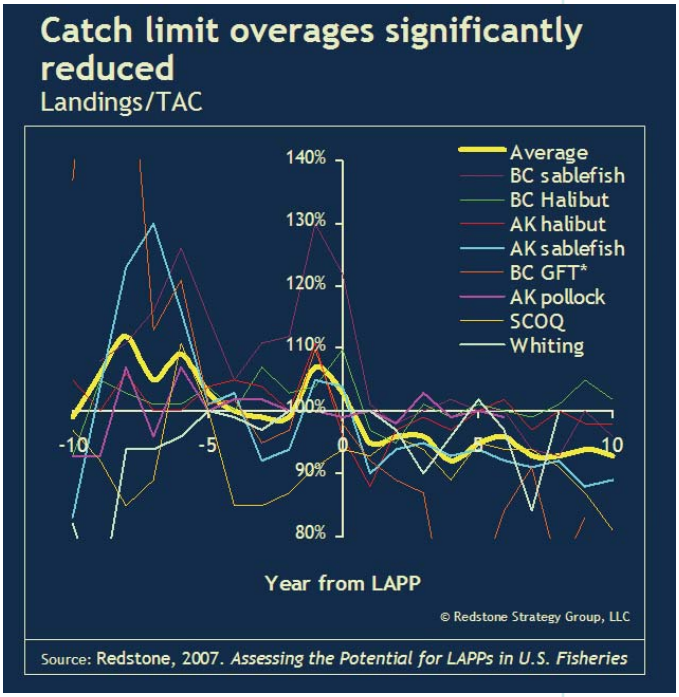
Effectively limiting the annual catch to a sustainable level is one of the most important objectives of fisheries management. To be sustainable, fisheries need catch limits that are identified, set at the appropriate level, and adhered to.

Under conventional management, catch limits are not always put into place; nor are they regularly adhered to even when they are set. Prior to LAPPs, catch targets were exceeded nearly 65% of the time.[19] Even though the average excess was usually fairly low, compounded annually it can greatly reduce the overall stock. Furthermore, some fisheries dramatically exceeded the targets: sablefish in British Columbia and some species in the British Columbia Groundfish trawl had overages between 20% and 60% respectively.[20]

This common practice of exceeding the target is like digging into the principal of any asset. Fishing away the principal year after year simply eats it up until the fishery is no longer sustainable.

LAPPs are fundamentally different and inherently more effective. Meeting catch targets is built directly into the design of the program — not estimated. *Once fisheries converted to catch shares, compliance with catch limits became standard practice.* Compliance levels rose from 35% to over 75% with violations being very small.[21] In fact, fishermen actually tended to err on the side of caution; combined landings averaged 5% *below* the cap.[22]

Even as certain LAPP-managed fish, such as Alaska halibut, became exceedingly popular with consumers and thus more valuable, fishermen stayed within their catch limits. In this case the LAPP actually contributed to halibut's popularity because it delivered a year-round fresh supply. This contrasts with conventionally managed fisheries, such as red snapper and monkfish which became overfished largely as a result of their popularity in the marketplace. Not only can LAPPs help prevent overfishing, but they have also been shown to aid in rebuilding stocks of depleted species. See Appendix B for further discussion.



Note: 'catch limit' is synonymous with TAC (total allowable catch)

** BC GFT uses average catch/TAC for pacific ocean perch (POP), hake, and yellowmouth rockfish as proxies*

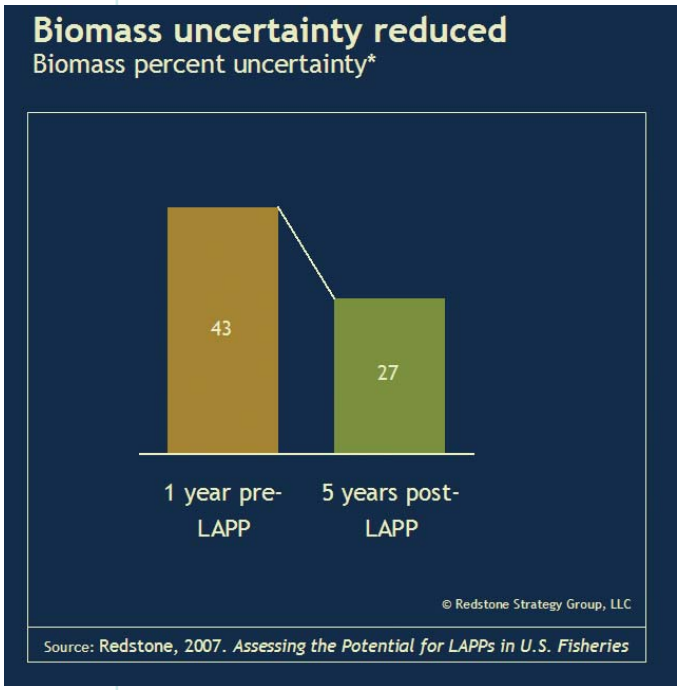
This turnaround in compliance with catch limits under LAPPs is a hallmark of other market-based approaches to environmental management. It stems from a simple, yet fundamental, change in incentives.

When regulators try to control catch levels indirectly, they do so by crafting technical rules designed to constrain how fishermen fish. The result is an escalating effort by fishermen to innovate ways to catch a lot of fish despite constraints. They are often successful and the fishery exceeds targeted catch levels.

Under LAPPs, conversely, fishermen are simply and directly permitted to catch — and held responsible for catching no more than — a specified amount of fish every year. The healthier the fishery becomes, the more they can catch. They also directly bear the cost, in penalties, potential loss of fishing privileges and reduced future opportunities, when they overshoot their limits.

2. BETTER SCIENCE AND MONITORING

Nearly three-quarters of LAPP fisheries have monitoring, compared to just one-quarter of non-LAPPs. Biomass estimates were significantly more precise.[23]



** % +- to achieve 95% confidence in estimate*

Fisheries management is required to be based on the best available science[24] in the United States. And an appropriate, scientifically-determined, well-enforced catch limit is a vital prerequisite to sustainable fisheries. Having high-quality data for modeling, interpretation, and application of science to policymaking is key.

Monitoring the catch is also necessary, both to ensure we have an accurate assessment of catch and bycatch and to improve our scientific understanding.

While the quality of the science used to inform fisheries management varies widely among fisheries, lack of adequate data is often cited as a problem. Surveys of fish abundance are often criticized because they are not conducted frequently enough, within the appropriate habitats or with unbiased gear and practices. Uncertainty in abundance estimates, along with a lack of hard data on the life history of fish and their productivity, forces scientists to estimate the important parameters that help determine the size of the total allowable catch. In some cases, the desire to protect fishermen's short-term economic interests prevails, and scientific uncertainty leads to the adoption of unsustainable catch limits.

For example, allowable catch limits for rockfish populations off California, Oregon and Washington were set at relatively high levels in 1990, based on several erroneous assumptions, including the assumption that these stocks were as productive as Alaskan stocks. This set the fishery onto the wrong trajectory. The scientific basis for the catch limits was then revised in 1993, based on new evidence that west coast rockfish were not nearly as productive as had been assumed.

However, more restrictive catch limits were not imposed until 1997, by which time some rockfish stocks had already declined to very low levels, precipitating drastic cuts and the declaration of a fishery disaster in 2000. Landings dropped 50% and revenues declined by $11 million.[25] Referring to this disaster, Penny Dalton, then the Fisheries Director at the National Oceanic and Atmospheric Administration, said: "A major underlying reason for the current situation is the lack of basic scientific data to conduct stock assessments and to set harvest limits that will maintain groundfish stocks at sustainable levels.[26]"

Under LAPPs, our research shows that science and monitoring work hand-in-hand to consistently improve management practices. With better monitoring systems in place, scientists can collect more accurate and timely information about fish stocks. *LAPPs contribute to improved science and monitoring in two key ways. First, 72% of LAPP fisheries had monitoring regimes, compared with only 26% of non-LAPP fisheries.*[27]

In addition, the precision of fish abundance estimates improved under LAPP management, from an average of ±50 percent five years prior to LAPP implementation, to ±25 percent five years after LAPP implementation.[28]

Setting a catch limit based on uncertain science can result in dramatic negative impacts, as seen in the rockfish example above. Under LAPPs, more money and better monitoring lead to better science, better science leads to reduced uncertainty, and reduced uncertainty leads to more appropriate catch limits. The result is healthier fisheries.

3. REDUCING BYCATCH

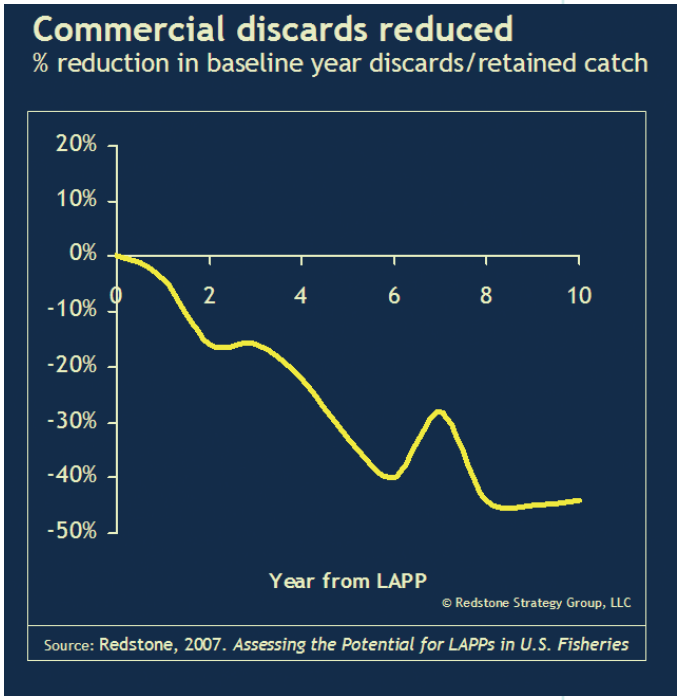
Bycatch was reduced by more than 40%,[29] which, together with the benefits of complying with catch limits, each year saves the equivalent of the annual seafood consumption of 16 million Americans.[30,31]

Bycatch is the unintended catching and disposal of fish and other animals not targeted in the fishery, including sea turtles, dolphins, corals and sponges. Globally, about a fourth of the world's total catch is tossed back, much of it dead or dying, for commercial and regulatory reasons.[32] In some fisheries, bycatch rates can be as high as fourteen pounds of bycatch per pound of targeted fish brought ashore.[33] For example, catching a pound of shrimp in the Gulf of Mexico in 2002 meant also catching 4.5 pounds of red snapper, mackerel and other sealife.[34] To avoid this squandered effort, wasted marine wildlife, and unnecessary damage to ecosystems, fishery managers justifiably place a high priority on decreasing bycatch.

Conventional fishery management approaches have used a variety of techniques to reduce bycatch, but the benefits of those efforts can be compromised by the perverse incentives in the system. Bycatch management often relies on specifying the type of gear, or the conditions under which gear can be used. For example, circle hooks can be mandated to protect turtles, or appropriate net mesh sizes can be used to avoid juvenile fish.

While often necessary, these strategies are undermined when the incentives in the fishery push fishermen to catch as many fish as they can, as quickly as they can. *In the fisheries we studied, bycatch was steadily increasing in the five-year period preceding LAPPs,[35] despite efforts to avoid it.*

However, by aligning incentives with conservation and employing bycatch quotas, LAPPs reversed this damaging trend and dramatically reduced bycatch by more than 40 percent.[36] LAPPs lengthen the fishing season and decrease the need to race against competitors. Fishermen thus gain the flexibility to target their fishing effort and experiment with new techniques, like test tows and better gear.

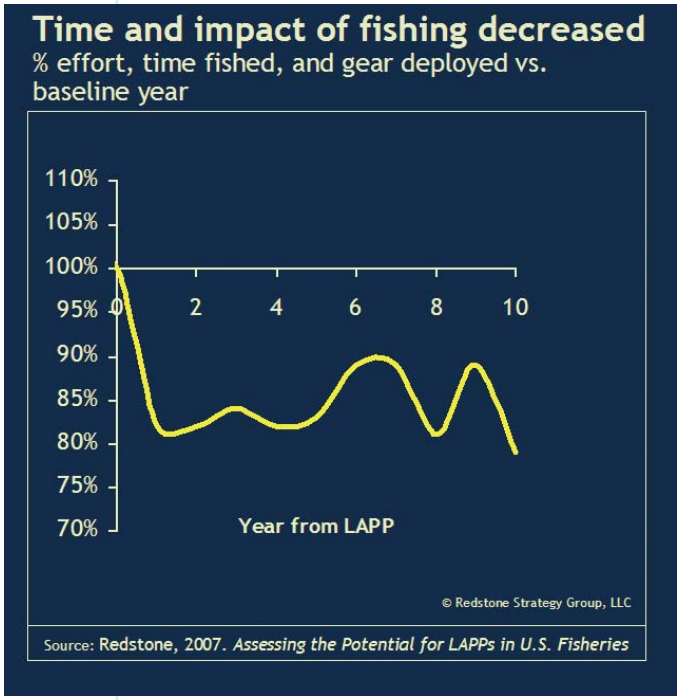


Fisheries with both LAPP and non-LAPP sectors, confirmed our findings. The Western Alaska groundfish fishery's LAPP sector has discard rates that are about 40% lower than the non-LAPP sector, the same rate for pre and post LAPP fisheries.[37]

Bycatch is likely reduced in two ways: 1) bycatch quotas, monitoring and enforcement are often part of a LAPP program, directly controlling the amount of bycatch and 2) under LAPPs fishermen have incentive to increase profitability by increasing efficiency and reducing waste. Bycatch can be both costly and wasteful.

4. LIMITING FISHING IMPACTS ON HABITATS

LAPP fisheries deploy 20% less gear[38]: less gear in the water likely translates into less habitat impact. All of the LAPP managed fisheries make use of ecosystem protection tools like time or area-based closures.[39]



Commercial fishing practices can significantly harm the habitats of fish populations and a rich diversity of other ocean wildlife. Large trawls dragging heavy gear across the bottom can alter ocean ecosystems and reduce biological diversity. Plus under a severe race for fish resulting from conventional management, it sometimes makes more economic sense for a fisherman to simply cut loose even expensive tangled gear, and reset new gear, rather than lose scarce allotted fishing hours. Ongoing "ghost fishing" by such derelict fishing gear is a significant problem — even in the new Northwestern Hawaiian Islands Marine National Monument, one of the most remote and undisturbed ocean habitats in the world. Damaged spawning, nursery and feeding grounds, loss of hiding places and diminished food sources — all harm fish populations and other ocean wildlife.

One key method for reducing habitat damage is to reduce the impact of fishing gear on habitats through improved gear design and reduction of gear in the water. *LAPPs help make such improvements by reducing overall fishing effort, time fished and gear deployed by 20%.*[40]

For example, in the Alaska federally managed sablefish fishery alone, there were 53 million fewer hooks in the water two years after the LAPP than two years before.[41] Taking into consideration lower allowable catch levels, fishermen reduced their use of hooks by 40% to catch the same amount of fish.[42] In addition, the study found that as the race for fish ends, fishermen increasingly can avoid losing large fishing gear, thereby decreasing ghost fishing.

Managers are increasingly turning to protecting sensitive habitats during all or part of the year to create safe zones for fish to reproduce and grow. While many fishermen support habitat conservation, others fear such protections will threaten their livelihoods. LAPPs can help change that dynamic — 100% of the LAPP-managed fisheries we studied have closures.[43]

5. MAKING FISHING SAFER

Under LAPPs, safety more than doubles.

Between the power and isolation of the ocean, and the heavy machinery operated on many vessels, commercial fishing and its frenetic pace are extremely dangerous. In the United States, the occupational fatality rate among fishermen is as much as 35 times higher than all-industry averages[44] (and they make nearly 30% less than the average male American worker).[45] It's no exaggeration to say that fishermen continually risk life and limb to deliver seafood to market.

Conventional fisheries management consistently requires fishermen to choose between their safety and making a living. In the absence of a secure catch allocation, individual fishermen must compete against each other and the elements to bring in as much fish as fast as possible. Racing to maximize their catch, boats may fish in dangerous weather conditions on treacherous waters, often far from any potential assistance, following grueling schedules with little sleep in order to compete.

In the five years leading up to LAPP implementation, as seasons shortened and catches were declining, safety deteriorated on average by 20% from previous levels.[46]

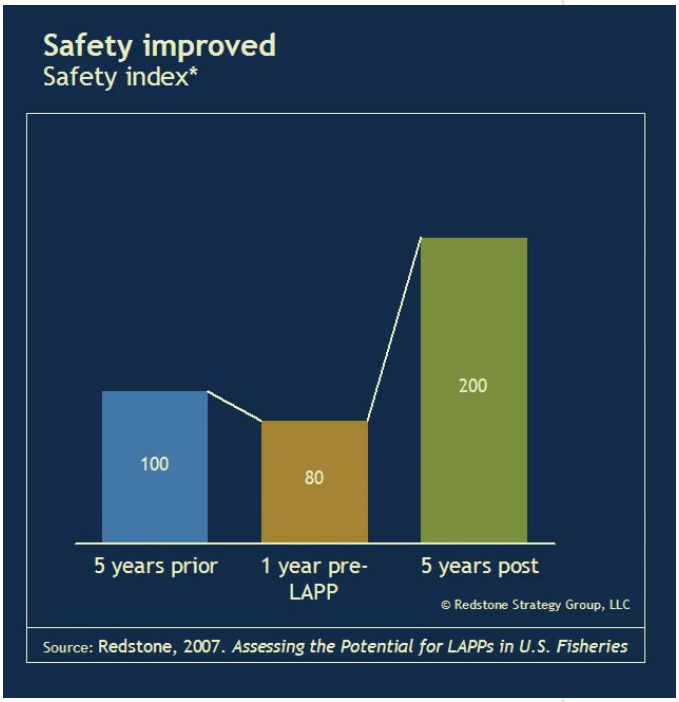
In the five years following LAPP implementation, safety — as measured by decreases in fatalities, vessels lost, search and rescue missions and safety violations issued — increased on average by 2.5-fold.[47]

For example, search and rescue missions in the Alaska halibut and sablefish fisheries decreased from 33 to fewer than 10 per year.[48] Fatalities dropped by 15% over five years.[49]

Safety experts have identified several key operational measures that impact safety. These include ensuring the integrity and stability of the boat; having safety equipment like survival suits, personal flotation devices and life rafts on board; and regularly training the crew in safety measures. While these and other steps will continue to be needed, they don't address the bottom-line financial necessity that sometimes compels fishermen to risk their lives in order to make a living racing against the clock at sea.

LAPPs largely eliminate the perverse incentives that create this situation. By allocating a secure share of the catch to the individual fishermen, LAPPs end the race for fish. *With that secure share in hand, a fisherman has the flexibility to weather a storm on shore rather than at sea, without losing the opportunity to earn a living that year.*

Commercial fishing will always be dangerous. But LAPPs can make one of America's most dangerous industries much safer.



** Safety index based on vessels lost, search and rescue missions, fatality rate, lives lost, and safety violations*

6. IMPROVING ECONOMIC PERFORMANCE

Revenues per boat increased by 80% due to higher yields per boat and higher dockside prices.[50]

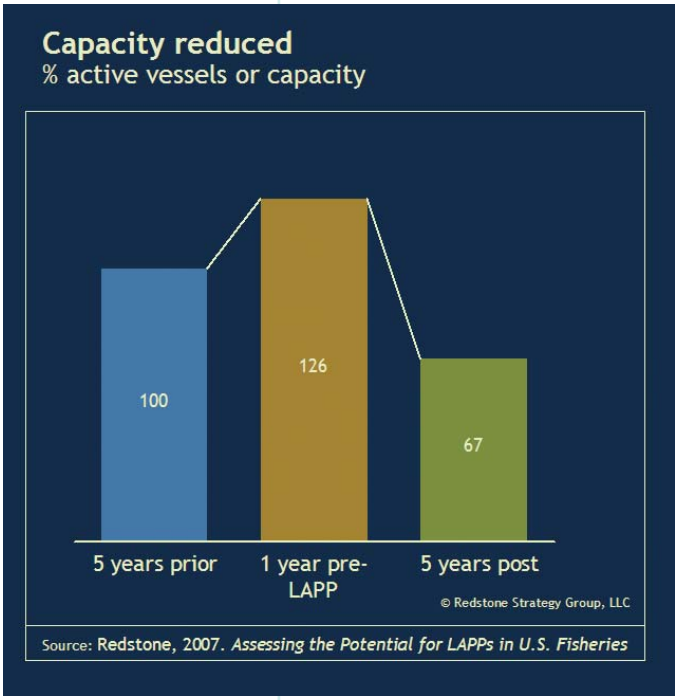
Historically, a common motivating factor for implementing LAPPs was poor economic performance. And in every case we studied, fishery economics did indeed improve dramatically.

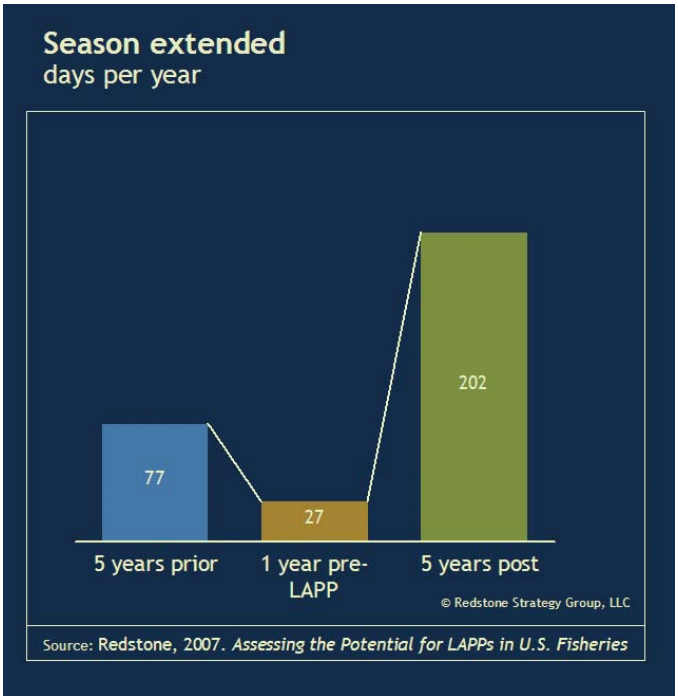
In the five years leading up to the LAPPs, the study shows that revenue per boat decreased, by an average of 10%. In the five years after LAPPs, revenues increased by an average of 80%.[51]

Even as revenues were declining pre-LAPP, the fishermen were expending ever more effort to catch their fish. Prior to the implementation of LAPPs, fishermen were working on average the equivalent of an extra day every week, just to catch the same amount of fish they had five years earlier. Fishermen were spending more money on fishing equipment, labor, fuel and other expenses, further reducing profitability.

With declining catches, increasing regulations, increasing costs, and relatively low revenues due to supply gluts and quality, fishermen, fishing communities and the public are not receiving optimal value from our fisheries. In 2005, US domestic fisheries landed 9.6 billion pounds of seafood, valued at $3.9 billion. If better managed, the same amount of fish could have yielded more than $5 billion and provided fresher, higher quality seafood to consumers.[52]

Most US fisheries are overcapitalized, meaning there are already too many boats with excess fish-capturing capacity for the allowable catch level. This overcapacity is a result of the regulations imposed by managers. In addition, nearly a fifth of our fisheries with Fishery Management Plans (FMPs) do not even limit



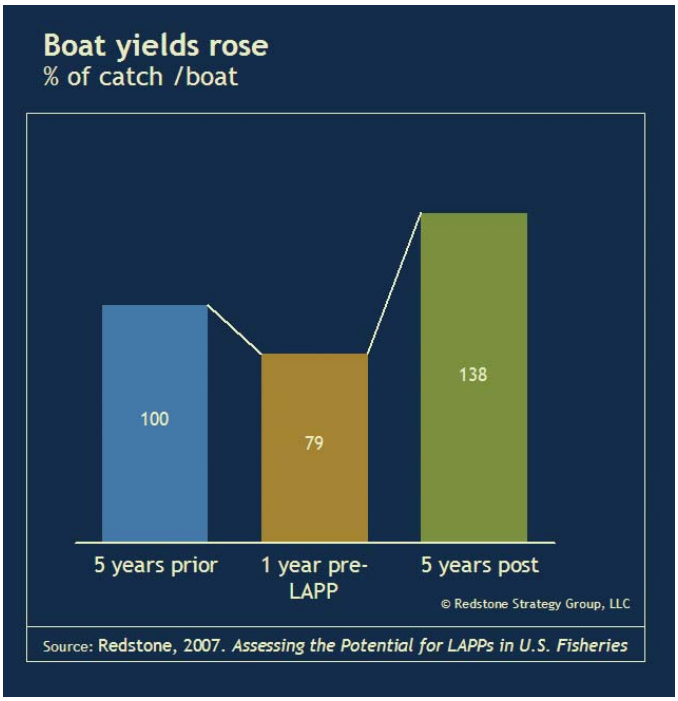


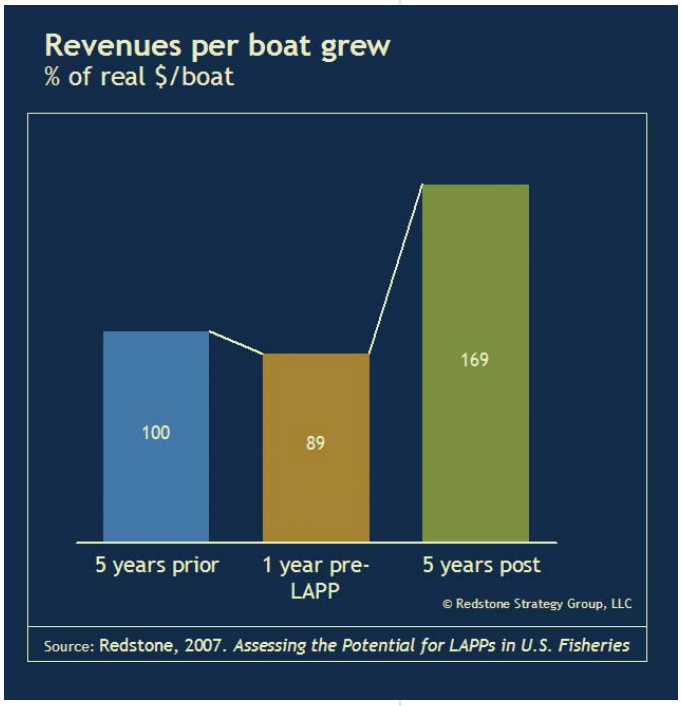
the entry of new participants,[53] not to mention those without FMPs.

LAPP fisheries efficiently match fishing resources to total allowable catch levels. Following LAPP implementation, capacity was cut by more than half. With less gear in the water and less competition at specific times, individual boat yields rose by 75%.[54] Each remaining vessel landed more fish and earned more money.

With a secure share of the catch, fishermen were able to plan their season around the market rather than the regulations. Seasons were extended on average by the equivalent of 35 work weeks per year.[55] Spreading out the supply over a longer season meant that the product was landed more consistently, and processors were able to keep it fresh, producing higher quality seafood and providing more value to fishermen and consumers alike.

From the fleet-wide scale to the individual fishermen, and on to the consumer, LAPP fisheries add value and quality to seafood. And the market value of this increase in economic productivity becomes reflected in the price of individual catch shares, increasing the asset value of the catch shares. This rise in value can create a stake in long term sustainability, especially in fish with shorter life spans. Also, depending on program design, some of this value can be returned to the public via transfer taxes when shares are sold or leased, fees and other mechanisms.





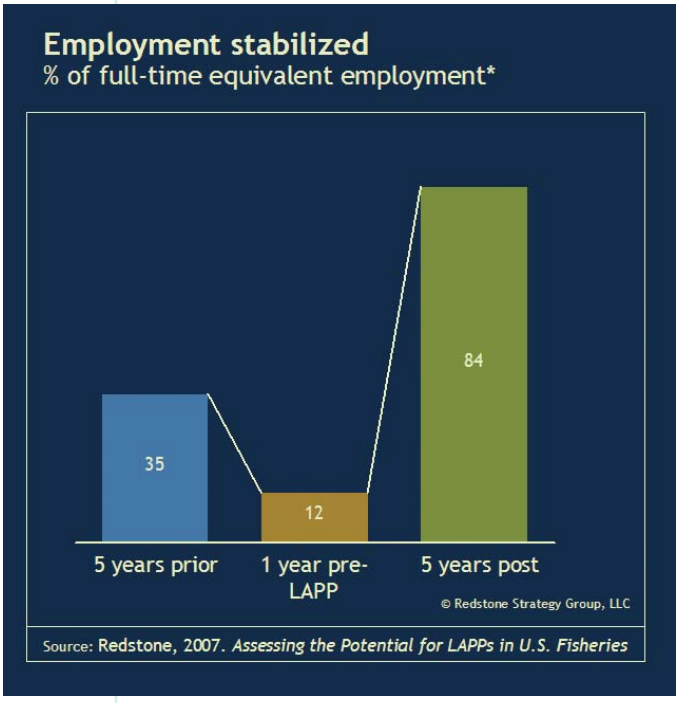
Ensuring Fairness to Fishermen and Communities

THE MAGNUSON STEVENS ACT instructs federal managers to consider the impact of their decisions on the well being of the people and communities that depend on fisheries.[56] At the urging of fishermen, and often their elected representatives, fishery managers go to considerable lengths to preserve existing fleet structures, landings in particular ports, the use of particular fishing gears and the viability of shoreside processing — in short, the protection of jobs and small businesses.

This is a laudable goal. But ironically, as we have too often seen, such an approach can result in tremendous dislocations in the long term, if the fishery subsequently collapses due to inadequate conservation measures that result from too many decisions that trade off long-term sustainability for short term economic relief.

Catch shares create profound changes in the nature of the fishing business. Not surprisingly, some of the most contested issues in the design of LAPPs involve how these changes affect existing jobs and fishing-dependent businesses.

Employment. The impact of LAPPs on jobs has been hotly debated, until now without the benefit of empirical evidence.



* Season length compared to average days worked in a full-time job

We found that the total amount of labor in a fishery — measured in fishing hours per season — actually increases very slightly with a transition to LAPPs.[57] *However, there are definite changes in the structure of the work force needed for fishing.*

Under conventional management systems, the labor market in the fisheries we assessed was dominated by seasonal and/or part-time work opportunities. Although these jobs can be dangerous, sporadic and sometimes are only modestly paid, there are, relatively speaking, a large number of them. They can be important to the economic structure of small fishing-dependent communities.

Fisheries operating under LAPPs require a different kind of work force. There are more full-time jobs available.[58] The work becomes more stable, safer, more year-round and more profitable. In the interviews conducted, fishermen working under catch share systems consistently rated their job satisfaction significantly higher than it was under the previous management system.[59]

At the same time, it is not hard to find fishermen or shoreside workers who lost the part-time jobs they held before. In the analyzed fisheries, following LAPP implementation, the absolute numbers of employment opportunities fell by over half, despite the fact that the amount of work stayed constant.[60]

For workers who find it difficult to compete in the new labor market, in the words of one fisherman: "It's great for the fish; it's great for the management; it's great for the economy. It's horrible for fishermen."[61] In lightly populated communities heavily dependent on seasonal and part-time

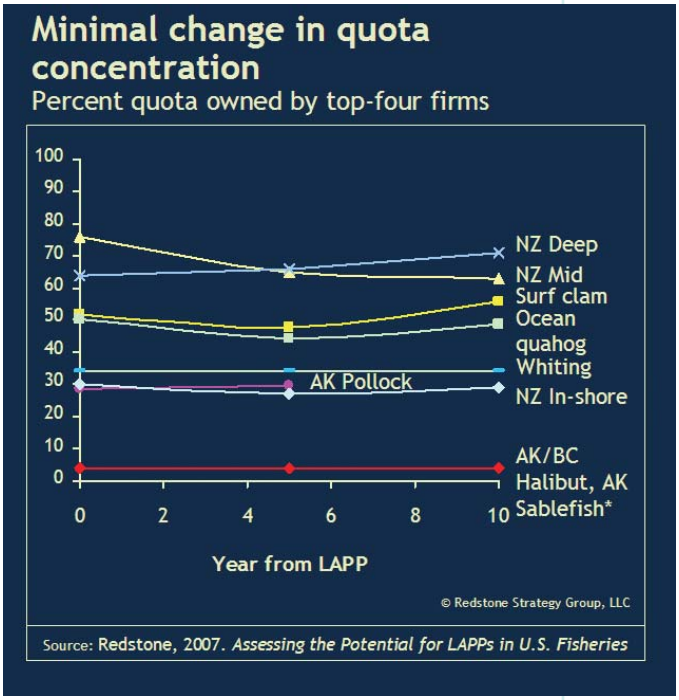
labor, such as Alaska, reports suggest that the loss of these jobs can have a major impact.

But, for other fishermen and communities, an increase to more stable, full-time employment is a welcome change. Employment stabilized under LAPPs. If averaged over a year, a typical crew position would have provided the equivalent of half a day's work per week before catch shares were introduced. Afterwards, LAPPs would provide over four days of work a week averaged over a year. However, total numbers of crew positions decreased by half. [62] This change may have had a similar effect on the nature of processing jobs and other shoreside support industries. While it represents a change from the current labor structure, there can be significant benefits. In addition, increased boat yields and revenues that accompanied LAPPs, likely translate into higher income for fishermen.

Ownership Concentration. Another objective of fishery policy in recent years has been to reduce the problem of overcapacity in fishing fleets. Overcapacity means that fleets have more fishing power than fish to catch. Excess capacity fuels the race for fish, makes it harder for individual fishermen to make a living, and wastes resources.

LAPPs quickly and efficiently solve the overcapacity problem. In most fisheries, the total number of quota owners dropped, typically by 10-25%. While this is expected and necessary to reduce capacity, a separate issue is ownership concentration. There has been concern that LAPPs might lead to excessive concentration of shares in the hands of just a few share owners. Excessive concentration is a problem from an economic point of view because it can create monopoly power. It can also be a problem from a societal point of view, if, for example, a fishing community wants to promote widespread ownership of LAPP shares in the community.

Specialists often use the amount of market controlled by the top four firms in any given sector as a key indicator to assess monopoly formation.



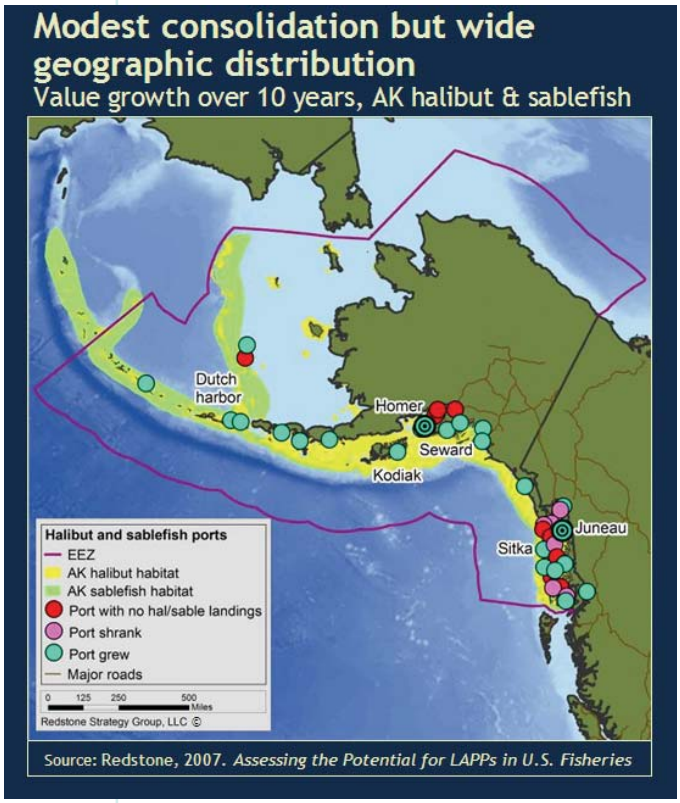
After LAPPs, there is little change in "four-firm concentration," indicating no significant change in quota concentration.[63]

* Maximum 4-firm is ~4% due to concentration limitations

The research also shows that some fisheries had high concentrations of ownership before going to LAPP management.[64] The driving factor behind this concentration appears to be the underlying capital requirements of the fishery. In fisheries like surf clam and pollock, which require capital intensive ships and processing, there are basic economies of scale. High ownership concentrations will exist with or without a LAPP.

In a number of instances, the LAPP design itself included specific limits on the total percentage of quota that one owner can hold. For example, in the Alaska and British Columbia halibut and sablefish fisheries, limits of between 1 and 2 percent have been implemented to preserve the historic small-boat nature of the fleet.[65]

Portside Communities. The fate of ports rises and falls with the value of the products that move through them. With commercial fishing, economic activities may include offloading, provisioning and processing activities. LAPPs have visible effects on those activities.



Illustrative public interests	Illustrative design options
Historic industry structure (e.g. gear types, small boat fleets)	• Concentration limits • Maximum leasing amounts • Vessel category or gear type restrictions
Stewardship	• Hard catch limits • Significant monitoring
Localize management and economic benefits to preserve fishing heritage	• Restrict trading within specific management zones • Require fishing experience • Limit to owners on board • Require U.S. citizenship
Promote economic efficiency	• Allow leasing • Open trades and leases for entire season • Allow middlemen traders
Minimize bureaucratic costs	• Create minimum transfer blocks • Minimize government involvement in trades

In the assessment of the Alaska halibut and sablefish fisheries, for example, fishermen did change their port landings patterns. Landings increased in some middle and high tier ports, while fishermen stopped landing fish at about a third of the ports.[66] In terms of landings, these ports represented 8% of the value.[67] We anticipate that changes were driven by the slower pace of fishing and the longer seasons, however, there could have been other factors that played a role.

We expect that LAPPs increase the aggregate well-being of ports, since the value of landed and processed fish increases. However, there are transition costs and some ports that have succeeded under the conventional management system can suffer.

Achieving social goals through LAPP design. Different fisheries can have varying goals. For example, one fishery may want to maximize economic efficiency while another may want to preserve the current owner-operator fleet structure. LAPPs can be designed to optimize these various goals.

A number of rules and provisions, from type of LAPP, to allocation and trading rules, have been commonly used by fisheries. Innovation could breed many more. Decision-makers should customize LAPP design to fit the needs and goals of their individual fishery, recognizing that trade-offs do exist.

For example, if some fisheries choose to favor existing fishermen or gear in allocation of shares, that may limit new entrants and gear innovation. Redstone Strategy Group has developed a decision tool to help identify and weigh the benefits of various design options for fisheries. This tool can be made available for LAPP implementation processes if parties are interested. [See Appendix C for a more complete discussion.]

Recommendations

BASED ON THE FINDINGS outlined in this report, we offer the following recommendations:

IMPLEMENT CATCH SHARES

The performance of LAPPs is undeniable. When implemented in the framework of a good management plan, fisheries improve, often dramatically. Compliance with catch limits increases, discards and fishing impact on habitats is reduced, science and monitoring improves, safety increases and individual fishermen are better off. LAPPs are a key component to ensuring sustainable fisheries and should be implemented more widely in order to save our fisheries and fishing communities

ENSURE ROBUST AND EFFECTIVE DESIGN

Any major reform to fishery management plans can take many years. Integrating catch shares into a management plan has been no exception, especially considering the unique environmental, economic, and social goals of each fishery. Fortunately, through the course of this study, we have identified several ways to make the process more timely, robust and effective.

▲ Educate stakeholders on LAPP programs and options

The challenges and issues that managers will face in designing catch share systems are predictable. Our study has produced a detailed assessment of design elements, frequently encountered barriers and successful strategies for stakeholders to develop catch share systems that maximize benefit and minimize transition costs in their fisheries.

In order to move LAPP programs forward more smoothly, we first recommend a rapid feasibility study, highlighting key expected outcomes of transitioning a specific fishery to LAPP management. This can be a relatively low-cost step that educates regulators and stakeholders about whether to initiate a full design, while building early consensus on key design parameters. Second, a design tool now exists that can be queried by stakeholders to identify typical solutions to LAPP implementation questions. The design tool can improve decision making by helping stakeholders narrow the sticking points and not reinventing the wheel.

▲ Improve efficiency of design process

LAPP implementation can have extremely long gestation periods. For the most part, LAPP designs can take five to 10 years from start to finish. Some of this time lag is driven by sound requirements for public notice and deliberation. However, at the federal level, council processes can be stalled because of diffuse decision making and membership changes on fishery management councils.

To ensure effective and timely design, federal and state regulators should create a small group of representative stakeholders with clear instructions as to the goals of the program, and a timetable for decision-making. It is essential that this design committee have open proceedings and adequate diversity in its representation. Protecting the public interest should be among the first of those mandates. Another critical element is credible conflict-of-interest standards for members of the design committee.

▲ Prioritize funding for LAPP design process

LAPPs can be effective at producing well-managed, environmentally sound and economically profitable fisheries. In addition, LAPPs help achieve the other three key pieces of an effectively managed fishery: a scientifically-determined catch limit, reduced bycatch, and reduced impact on habitats. In light of their performance, state and federal funding should be prioritized to implement LAPPs in well-designed fishery management plans. In addition, due to their

considerable economic upside, LAPPs offer the opportunity to leverage private capital to aid in their implementation. Private capital can be applied in a variety of ways, including financing buyouts to reduce fishing capacity and lower transition costs of LAPP management, or an investment in the LAPP development process itself. Investments can be repaid through fees on landings or a share of the wealth increase.

INVEST IN THE FUTURE

We urge stakeholders to see the increase in value created by catch shares as a way to help meet needs including: Helping cover the costs of running catch share systems; improving data collection systems to improve the science behind the management; achieving the social objectives of particular communities; or increasing the levels of monitoring, enforcement and research.

Stakeholders have a wide range of approaches to choose from in helping meet these needs, including landings fees; share auctions; fishermen financing of monitoring; and allocation of shares to particular ports, communities or fishing groups.

Not only does such revenue sharing help reduce friction; the discussion also helps clarify the tradeoffs inherent in various program design choices. For example, restricting trading or putting caps on share ownership can reduce changes to the fishery's post-LAPP ownership structure. But it can also decrease future profitability, by preventing less efficient fishermen from selling their shares to more efficient colleagues. This reduced economic gain can translate into fewer funds available for other goals.

EMPLOY THOROUGH REVIEW AND PROGRAM ADAPTATION PROCESSES

Catch share programs should be adaptive to regularly improve performance of program goals and address any new issues that may arise. This requires updated science as well as a robust process for addressing necessary management changes.

In fact, some LAPPs have performed well in this regard. For example, the orange roughy LAPP fishery in New Zealand was initially divided among participants inappropriately, as fishermen were provided a dedicated amount to catch rather than a proportion of the total catch limit. As such, managers were unable to set an annual limit less than the initial total allocation, and the fish populations suffered. However, changes to the allocation structure were made when the problem was identified, and the fishery is now on a recovery track. Likewise, regular reviews of the Alaska halibut/sablefish LAPP fishery by a standing advisory committee have improved program performance. The recently implemented yet controversial Alaska crab LAPP is undergoing an early review and is required to have a comprehensive review at year five, which is likely to lead to substantial program changes.

It is important that all LAPPs be required to undergo strong regular reviews and that any necessary changes be made in order to meet program goals and relevant legal requirements, including the National Standards of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). NOAA Fisheries should provide clear instructions on program reviews. At the same time, program designers need to be careful not to constantly change programs, since participants need some certainty and longevity of program structure in order for them to reap the economic benefits of conservation.

Appendix A

Comparing Catch Shares With Allocations of Other Public Resources

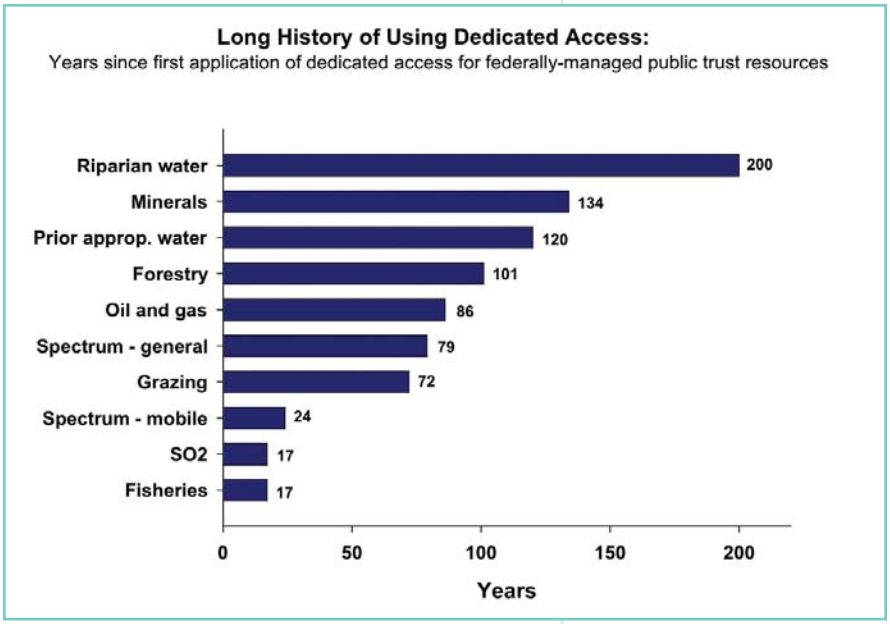
FISHERIES are one of the latest, but by no means the only area where US policy makers have had to grapple with the "tragedy of the commons." There are instructive themes that emerge from the history of how other public resource allocation policies have evolved over the last 200 years. [Analysis conducted by Professor Lawrence J. White.[68]]

We looked at seven such areas:

- surface and riparian water usage
- hard rock mineral (metal) mining
- forest logging on public lands
- oil-gas-coal extraction from public lands and offshore waters
- use of electromagnetic spectrum (e.g., cell phone frequencies and radio waves)
- grazing on public lands
- control of sulfur dioxide emissions by electric utilities

A common solution to the "commons problem." Since the earliest days of our nation, policy makers have concluded that a prerequisite to ensuring that a public resource is well-managed is to develop a system where individuals or companies are granted exclusive privileges to use that resource to provide a good or service to the public.

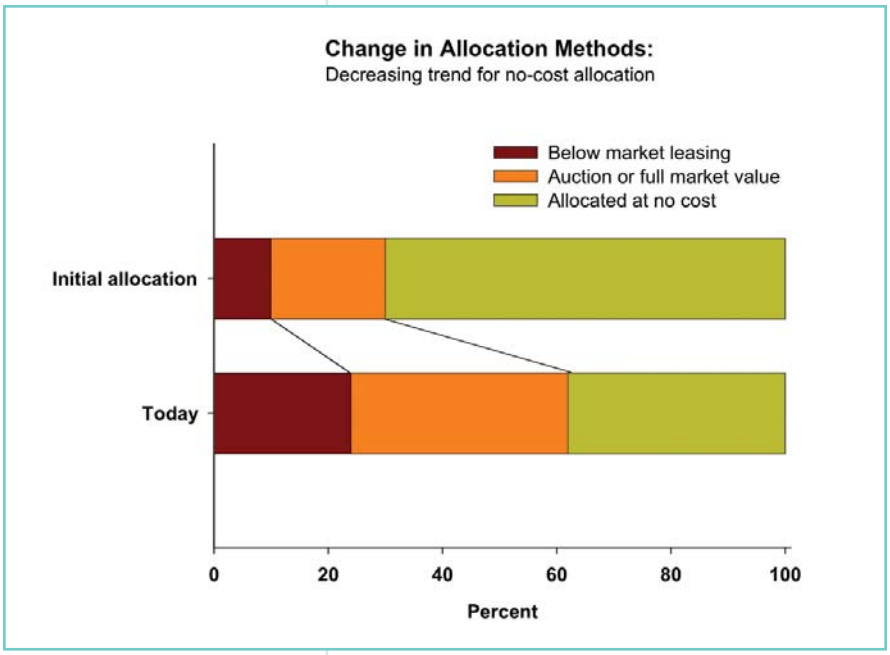
But private use privileges are only part of the solution. Private use privileges solved the common pool problem, but in each case there were other critical issues policy makers addressed through rules and conditions of use. With respect to the electromagnetic spectrum, for example, policies were enacted to help small businesses gain access to the airwaves. With SO_2 emissions, Congress established a system to ensure permits for new entrants, and prevented power companies from emitting SO_2, even with permits, if it violated local air quality standards.



Source: White, L. 2006

There is a trend to capture more value for the public. Use privileges have value. Sometimes this value is captured for the public through auctions (as in cell-phone spectrum, forestry, and oil-gas-coal). Sometimes below-market fees are assessed (as in grazing, surface water, and hard rock mining). And sometimes the resource is simply given away (as in SO_2 emission permits and "traditional" spectrum licenses).

Where auctions are held or fees charged, some or all of the proceeds can be earmarked for covering the costs of the program, as well as for



Source: White, L. 2006

investments in the resource and other public benefits. Newer systems tend to require greater contributions from the use privilege holder.

Allocation mechanisms can be weighted so as to favor specific groups. For the post-1994 spectrum auctions, in some instances the bidding rules have been adjusted so as to favor small businesses and other groups. Some timber auctions have been reserved for small businesses. On the other side, policy makers have placed limits on accumulation (spectrum for example), though by and large, policy makers have relied on the Justice Department and other regulatory bodies to police the accumulation of use privileges.

Conditions on use privileges are durable but need updating. Conditions that were historically put on use privileges to ensure that natural resources would be fully exploited can easily be at odds with today's conservation needs.

Consider grazing rights. A series of rules were developed to accompany grazing rights that were, among other things, intended to keep rangeland in productive use. Today this presents conservation challenges. The combination of use-it-or-lose-it requirements and mandatory grazing utilization levels can lead to overgrazing and deterioration of the land. And land that might be better suited to other uses — or better just retired — cannot be.

In other words, some of today's environmental criticism of use privileges like grazing rights are not aimed at private use per se, but rather at outdated historic restrictions that now prevent taking needed conservation actions or modernizing management practices.

Existing users get preference for allocation. Traditionally, where there was a set of existing users of a resource, policy makers believed allocation should favor those incumbents. Doing otherwise would, in their view, take away a de-facto use privilege without cause. For instance, with water, a criterion for allocation was prior use. For SO_2 emission permits, it was SO_2 emissions during the historical 1985-1987 period. Where there were no prior users, distribution systems try to have some concrete basis for the allocation. Auctions (for cell-phone spectrum since 1994, timber, and oil-gas-coal) solve this problem by awarding the permits to the highest bidder. A lottery (as for cell-phone spectrum in the 1980s) solves this problem through chance. In some cases, the size and value of the allocation was commensurate with the magnitude of prior use.

Policies seek to give long term security without creating a right. Some use privileges are given in perpetuity (SO_2, water). Where permits have limited lives (i.e. spectrum, grazing, forestry, and oil-gas-coal leases), a typical tenure is 10 to 15 years and there is usually a strong presumption — but no guarantee — of renewal. Policy makers have established this precedent to encourage long-term investment and other decision making. The presumption is not the same as having secure property rights. Among other things, they are not compensable in the event that their value changes as a result of regulatory change or other factors.

Appendix B

Catch Shares Can Help Rebuild Overfished Stocks

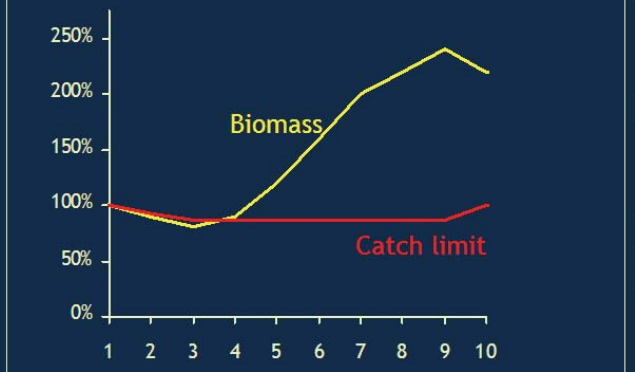
IN THE UNITED STATES, managers set catch limits based on the maximum sustainable yield. When fish stocks are overfished and/or when overfishing is occurring, managers are required to implement rebuilding plans to recover the stocks.[69] One-quarter of US fisheries that have been assessed are overfished.[70] Seventy-four stocks now require rebuilding plans and 67 plans are in place.[71] In the decade since rebuilding plans have been required, about half of the stocks with rebuilding plans have experienced an increase in biomass, but less than 5% are considered rebuilt.[72]

None of the 10 fisheries in this study were overfished when LAPPs were implemented. However, we have seen how LAPPs improve science and monitoring, as well as setting and complying with catch limits in fisheries. These are all vital piece to recovering fish stocks: So, can LAPPs help rebuild fisheries?

Looking to New Zealand, a country with significant experience in LAPP management, we see the answer is, "It can." Rock lobster fishermen reduced catches under LAPPs to 50% of historic levels. Within 10 years, the fast-growing rock lobster biomass doubled and fishermen were able to raise catch limits without overfishing stocks.[73] Orange roughy on the other hand is a slow-growing species. Due to poor stock assessments prior to LAPP management, catch limits were set too high and the biomass was reduced to one third of historic levels. Catch limits were ratcheted down, and rebuilding slowly occurred. The stock is now over 60% higher than historic lows.[74] When deployed in a well-constructed management plan, LAPPs help rebuild stocks by ensuring catch limit compliance, improving science and rewarding fishermen in the long-term for conservation action taken today.

Stocks recover as managers adjust catch limits

Relative biomass and relative catch limit for New Zealand rock lobster*

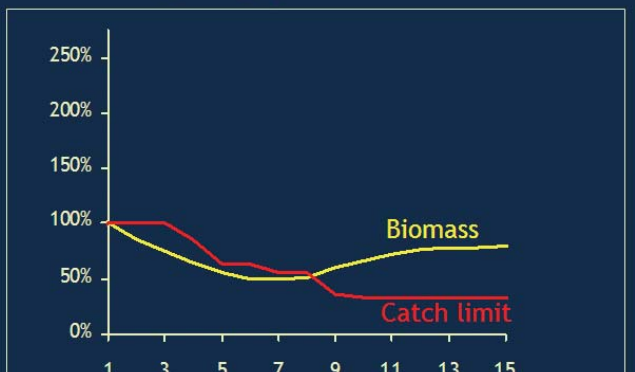


Source: Redstone, 2007. *Assessing the Potential for LAPPs in U.S. Fisheries*

** Area CRA4 taken as representative for NZ rock lobster fishery, year 1 is the first year of LAPP implementation (1990)*

Long-lived species also recover with catch limit management

Relative biomass and relative catch limit for New Zealand orange roughy, area 3B



Source: Redstone, 2007. *Assessing the Potential for LAPPs in U.S. Fisheries*

Appendix C

A Design Tool for Fishery Managers

RESEARCH of past LAPP implementation and extensive interviews with stakeholders determined that LAPP implementation is both challenging and time-consuming. Many of the challenges center on getting a good design in a timely manner. For example, the Gulf of Mexico Fishery Management Council took approximately 10 years to design and implement an IFQ program for red snapper.

Recognizing these challenges, Redstone developed a design tool that identifies options for LAPP design based on past experience and candidate fishery characteristics. The tool is designed to complement the appropriate Council process. It does not identify the right answer, but it does lay out options for an effective design. The tool can be a powerful and appropriate way to streamline decision-making; identify, organize and narrow options; and illuminate potential trade-offs.

The tool is comprised of five design elements: LAPP form, Allocation, Monitoring, Socio-economic Regulations, and Environmental Regulations. For each design element there are a number of historically-used design options.

For any fishery, quantitative and qualitative data is collected on over 50 characteristics, which are then used to inform a design recommendation. Significant data have already been collected for 76 U.S. fisheries. For each design element, a select number of characteristics contribute to determining options for consideration.

The tool is driven by the past experience of LAPP implementation and informed by fisheries that are currently in progress. The characteristics are given an applicability score based on necessary conditions for certain design elements, as well as common "best practices" used in the other 10 LAPP implementations. The applicability of each design element is compared to the other design elements and the one that has the highest applicability score is reported out by the design tool. In some cases, more than one may be reported out.

The tool runs through this framework for each design element. Some are more complicated. For example, the monitoring section estimates how much each monitoring type will cost and identifies the most effective, least cost option. The design tool also seeks to identify trade-offs between certain trading rules, such as concentration limits, and the ability for a fishery to pay for an effective level of monitoring. In this way, the tool can help decision-makers understand design trade-offs and make informed decisions.

Fishery managers should work in conjunction with the tool developers to understand the tool, groundtruth and update fishery information and ultimately identify a timely, well-informed, decision about the best design of a LAPP.

Appendix D

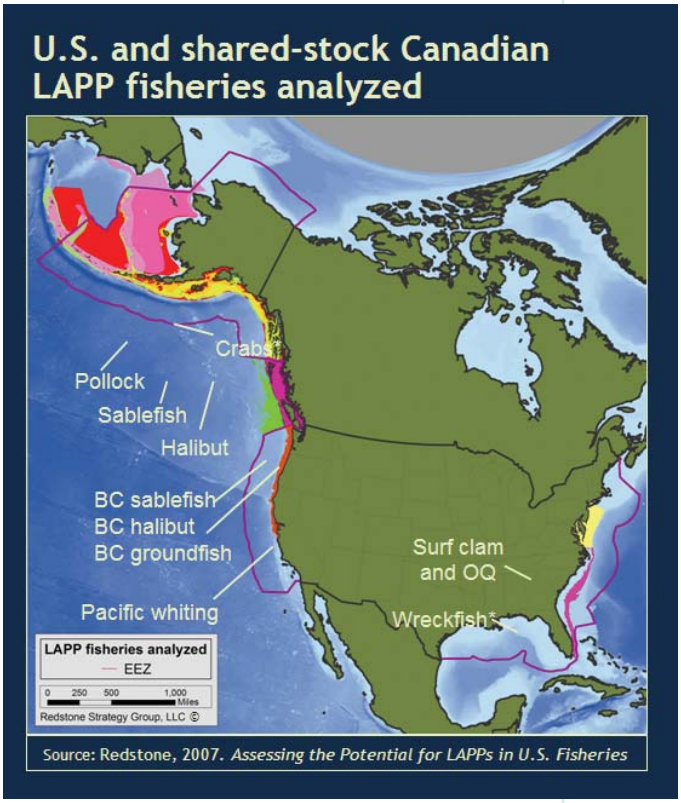
Methodology

THE COLLECTIVE RESEARCH presented herein is the most up-to-date analysis of Limited Access Privilege Programs (LAPPs). In total, this study collected information on nearly 100 fisheries and includes both a compilation of existing data and original quantitative and qualitative research on the performance of select LAPP programs; analysis of important public resource allocation design and conversion issues; and development of a design tool based on empirical data and analysis.

While the opinions expressed in this paper are solely those of Environmental Defense, the report draws heavily on selected findings from a recently-completed study conducted by Redstone Strategy Group, LLC that was commissioned by Environmental Defense and completed in partnership with the Gordon and Betty Moore Foundation. The conclusions from that study are available in separate documentation at www.redstonestrategy.com/nonprofit/publications. Professor Lawrence White, New York University, conducted the analysis of public resources allocation.[75] The full paper can be found at: http://w4.stern.nyu.edu/emplibrary/6-18_White.pdf

Redstone completed a detailed performance analysis of all seven federal United States LAPP programs and three British Columbia LAPP programs with shared US-Canadian stocks:

1. Mid-Atlantic surf clam/ocean quahog (SCOQ, implemented in 1990)
2. British Columbia sablefish (1990)
3. British Columbia halibut (1991)
4. South Atlantic wreckfish (1992)
5. Alaska halibut (1995)
6. Alaska sablefish (1995)
7. Pacific whiting (1997)
8. British Columbia groundfish trawl (1997)
9. Alaska Pollock (1999)
10. Alaska king crab (2005)



The analysis includes pre- and post-LAPP implementation performance of the fisheries based on the following indicators:

- Environmental — catch limit compliance, discards and bycatch rates, fishing effort
- Economic — overcapitalization, season length, catch per boat and revenue per boat
- Social — safety, employment, ownership structure, and port activity

** Due to the new implementation of AK crabs fishery (2005) and the short life of the wreckfish fishery, many analyses in the report have limited data on these fisheries*

For some indicators, indices were developed to condense and compare varying information within each fishery. For example, safety is an index based on a compilation of fatalities, search and rescue missions and other information.

To evaluate performance, Redstone analyzed over 150 sources of data including reports, books, studies, GIS data and raw data, and conducted three in-depth case studies (Mid-Atlantic surf clam ocean quahog Individual Transferable Quota program, British Columbia groundfish trawl Individual Vessel Quota program and Georges Bank cod hook sector), gathering quantitative and qualitative data on LAPP performance. Redstone analyzed performance of fisheries 5 years prior to LAPP implementation, 1 year prior to implementation, and 5 years after implementation, capturing the trends of fisheries leading up to and following the LAPP. The results highlighted in this report are averages of all fisheries. Alaska crab is not included in the post-LAPP analysis because of the newness of the program and lack of available data. However, Environmental Defense has commissioned a review of the Alaska crab program by Phil Smith that will assess many of the same performance indicators outlined in this study.

The case studies were comprised of semi-structured, in-depth interviews with a variety of stakeholders: fishermen, processors, fishermen organizations, environmentalists, community representatives, government agencies and others.

Redstone further collected performance indicator data on 76 of the largest US fisheries, and conducted in-depth, interview-based case studies of two fisheries currently in some stage of LAPP implementation: Pacific coast groundfish trawl and South Atlantic snapper grouper. Based on this information and analysis, they developed a data-driven design tool that can be used in conjunction with stakeholders to identify good LAPP design options.

Redstone also looked to examples of LAPP programs in New Zealand and around the world to provide context for the study. In some cases, data from other countries is included to illustrate specific points.

Dr. White researched and analyzed important public resource allocation and design issues to understand the history of public resource management and glean lessons and "best management" practices. White reviewed seven other public resources with histories of allocation in the United States and assessed common allocation methods and designs, with particular attention to the applicability for commercial fisheries.

This report focuses solely on commercial fisheries. Recreational fishing is also growing in popularity and impact on our ocean resources cannot be ignored. We do not specifically include or address the recreational sector of fishing in the report. However, we believe the catch shares solution outlined here can be one answer to successfully managing some types of recreational fishing operations.

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Report by Op-Ad Media, www.op-ad.com
Edited by Art Siverman. Designed by Michael Molanphy.

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