

LENFEST OCEAN PROGRAM

RESEARCH SERIES

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New study challenges assumptions about ecological benefits of catch share programs

CATCH SHARES IMPROVE CONSISTENCY, NOT HEALTH, OF FISHERIES

A SUMMARY OF NEW SCIENTIFIC ANALYSIS:

Essington, T. 2009. Ecological indicators display reduced variation in North American catch share fisheries. *Proceedings of the National Academy of Sciences.*

CATCH SHARE PROGRAMS, in which individual fishermen or fishing groups are allocated a percentage of the total allowable catch, have been put in place in fisheries throughout the world and are under great consideration in the United States. Governments have implemented catch share programs as a way to improve sustainability of fisheries because they could discourage a race for fish and promote ecological stewardship. Yet, there is inconclusive evidence as to whether catch shares actually lead to healthier fisheries and ocean ecosystems.

Dr. Timothy Essington compared a variety of indicators, or metrics, of ecological health across 15 catch share programs in North America. He looked for changes in average values of these measurements over time, such as how much the weight of fish landed varied, and he also examined how much the metrics varied each year. His analysis showed only minor changes in ecological health when a catch share program was implemented. Catch share programs did result, however, in more consistent and predictable measurements of fisheries and ecosystem health over time. This *Lenfest Ocean Program Research Series* is a summary of Dr. Essington's findings.

PREVIOUS CATCH SHARE STUDIES—A CONTEXTUAL FRAMEWORK

Previous analyses of catch share fishery programs found inconsistent impacts of catch share programs. Examples of these studies include:

- Christopher Costello (2008) and his colleagues used fishery landing data to show that fishery collapses were less common in catch share fisheries.
- Cindy Chu (2008) found no consistent or significant changes in population size after the implementation of catch shares.
- Trevor Branch (2008) reviewed specific case studies and found some anecdotal evidence that habitat damage and fishing effort were reduced in catch share fisheries. Yet, he also found examples of situations where this was not the case.

CATCH SHARE PROGRAMS

The term "catch share" refers to a management system in which individual fishermen or groups of fishermen are allocated a share of a total allowable fishing quota. Variations include differences in how the quotas are distributed and how much of the total allowable catch can be distributed among the fishermen. Catch share programs are also referred to as limited access privilege programs (LAPPs), dedicated access privilege programs (DAPPs), and include individual transferable quotas (ITQs), individual quotas (IQs), community based management systems and fishery cooperatives.

Some nations have promoted catch share programs as means of improving fisheries management and economic efficiency as well as the health of marine ecosystems. Yet previous studies have come out with markedly different conclusions about their environmental benefits. Most of these studies, however, used either single indicators of ecosystem health or anecdotal evidence. But, limited metrics may not yield enough information about the full range of impacts of the catch share program, and using anecdotal evidence does not allow for the control of other factors potentially affecting outcomes, such as other policy changes being implemented at the same time, or in the same place, as the catch share program.

STUDY METHODS

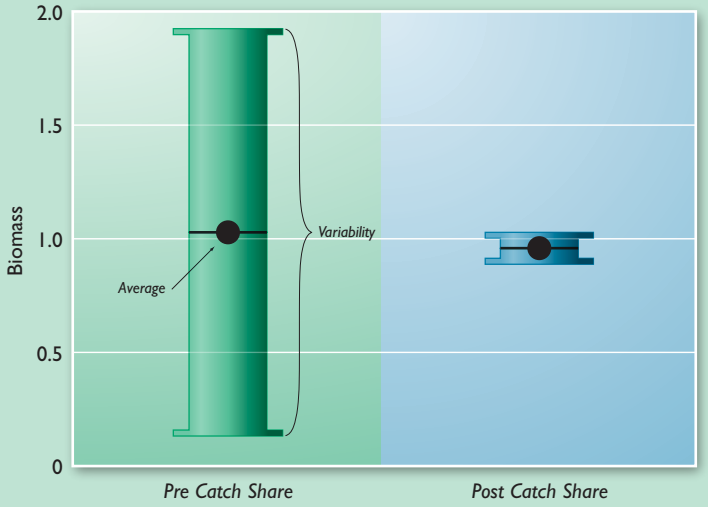
The data collected in this study were from North American fisheries managed through catch share programs. Essington compiled multiple metrics of fishery and ecosystem health, including:

- Fish population biomass (total amount of a given species of fish found in its current population);
- Exploitation rate (the fraction of the population harvested each year);
- Catch-to-quota ratios (amount of fish caught in relation to the amount that is legally allowed to be fished);
- Fishing effort from potentially damaging gear such as bottom trawls and dredges (usually measured as the time spent fishing with the gear);
- Discarding of target species (amount of less valuable portions of the target species discarded when caught and not counted against the quota); and
- Fishery landings (amount of a species caught and brought to shore to be sold, usually measured by both weight and monetary value).

Essington used three different comparative methods to analyze whether implementation of catch share programs changed the average value of these metrics or their year-to-year variability. These methods controlled for confounding factors, such as changes in the fishery unrelated to the catch share program. First, he evaluated changes in metrics for fisheries before and after their switch to a catch share system. Essington also compared catch share programs to non-catch share programs within the same fishery. Third, he compared catch share fisheries and non-catch share fisheries over time. For each comparison, he calculated the rate of change in the average (mean) and variability (variance) of each ecological indicator after a catch share program was implemented. Finally, Essington combined data from multiple fisheries to estimate an aggregate rate of change in the mean and variance for each ecological indicator.

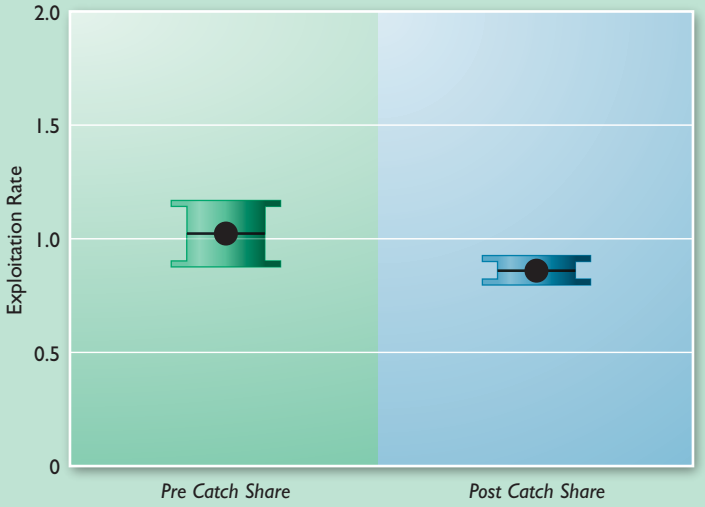
FIGURE 1: DECLINING VARIABILITY AFTER CATCH SHARE IMPLEMENTATION

BIOMASS



These figures show two measurements of fisheries and ecosystem health used in Essington's study and how their variability over time declined after the implementation of a catch share program. The mean (average) for each metric before and after the implementation of the catch share program is represented by a black circle. The shaded area above and below the black circles represents the amount of variability in the measurement over time.

EXPLOITATION



This figure is an example from the Alaskan sablefish fishery. The biomass, or total amount of the species, and exploitation rate, or the fraction of the population harvested each year, did not change a great deal in value, but became much less variable once the catch share program was put in place. Both biomass and exploitation rate are measured as a ratio of their actual amount to the amount proposed by fishery managers.

HOW CATCH SHARE MANAGEMENT AFFECTS FISHERIES

Essington showed catch share programs in North America resulted in greater predictability within the fisheries (with fewer large fluctuations in fishing effort), more consistent fleet behavior (with improved regularity of compliance) and more stable landings over time (see Figure 1). The author suggests these results may be due to improved fisheries management (e.g., incentives for improved compliance) under catch share programs so that large fluctuations are avoided. The results also show a trend toward decreased discard rates when a fishery was managed through catch shares.

Essington found only minor differences between most catch share fishery programs and non-catch share fisheries in the various metrics of ecosystem health, such as the amount of fish caught or discard rates. Yet, most of the examined fisheries had relatively high population biomass and low exploitation rates at the inception of the catch share program. Though one common purpose of catch share programs is to reduce overfishing, population health might not change much if the fishery is not already overexploited.

This study also explains some of the inconsistency in results of previous studies on ecological impacts of catch share programs. Costello et al. (2008) found that catch share programs experienced fewer large drops in fisheries landings and thus were less prone to stock collapse. Chu (2008) found little evidence for significant changes in fish populations. Essington points out that the results from Costello et al. (2008), when considered in the context of this new study, could be viewed as a reduction in variance of landings in fisheries with catch share programs. Thus, both of these previous studies are consistent with Essington's findings that catch share programs result in less variation in the fishery but do not necessarily improve indicators of ecosystem health, such as average biomass.

CONCLUSIONS

Essington's analysis shows that North American fisheries primarily respond to implementation of catch share programs by becoming more predictable and consistent. He also demonstrated that catch share programs may not necessarily lead to higher stock levels and lower average exploitation rates; however, these results may depend on whether a fishery is significantly overexploited at the inception of the catch share program. Thus, he suggests catch share programs might best be viewed as one option for sustainable fisheries management within a suite of possible management tools, such as no-take marine reserves, ocean zoning and ecosystem based management.

Catch share programs may not necessarily lead to higher stock levels and lower average exploitation rates.

Literature Cited

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LENFEST OCEAN PROGRAM

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