

## **VOLUNTARY APPROACHES TO TRANSITIONING FROM COMPETITIVE FISHERIES TO RIGHTS-BASED MANAGEMENT**

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### **ABSTRACT**

Despite potential advantages of rights-based management over competitive fisheries, there has been significant political resistance to rights-based management from many fishermen, which has slowed the adoption of rights-based management. This paper explores the concept of voluntary transitions to rights-based management, under which fishermen may choose between an allocated fishery (with individual or group quotas) or a competitive fishery, and the relative distribution of the total quota between the allocated and competitive fishery depends upon how many fishermen choose to participate in each. Voluntary transitions are possible if (a) access has already been limited; and (b) it is possible to divide the fishery—for example temporally or spatially—into two fisheries managed under different rules. By allocating disproportionately more fish to the competitive fishery, voluntary transitions may become a “win-win” approach under which both groups become better off, while over time an increasing proportion of fishermen choose to join the allocated fishery. This paper uses an experimental approach, in which subjects simulate actual fishing, to test and demonstrate the potential of voluntary transitions from competitive to rights-based fishing. The paper also discusses the Alaska Chignik salmon cooperative, an example of a voluntary transition from competitive to rights-based fishing.

**Keywords:** Rights-Based Management, Fisheries, Voluntary, Experiment, Chignik

### **INTRODUCTION**

Even when entry is limited, significant rent dissipation may occur in competitive fisheries (Wilens 2004). Competition between fishermen may result in increased costs (as participants spend more to try to increase their share of the catch) as well as reduced product value (due to poorer handling, lower recovery, and shorter seasons). Figure 1 illustrates two mechanisms by which rent dissipation occurs in Alaska’s Bristol Bay drift gillnet salmon fishery.

Rights-based fisheries management offers significant potential economic advantages over competitive fisheries. These advantages include lower capital costs, lower operating costs, more efficient use of capital, improved utilization, and improve potential to increase market value by meeting market demands for product quality, product variety, and timing of supply.

Despite potential advantages of rights-based management over competitive fisheries, there is often significant resistance to rights-based management from many fishermen. This resistance has slowed or stopped the adoption of rights-based management in many fisheries (including the Alaska Bristol Bay salmon fishery).

Why would some fishermen oppose rights-based management, which economists believe would make them better off? There are many potential reasons, including: (1) Some fishermen may not understand the reasons for which economists believe rights-based management would make them better off; (2) Some fishermen may understand but not believe the reasons that economists believe rights-based management would make them better off (they may doubt that rights-based management will work in practice like in theory); and (3) Some fishermen may correctly perceive that rights-based management would not make them better off.

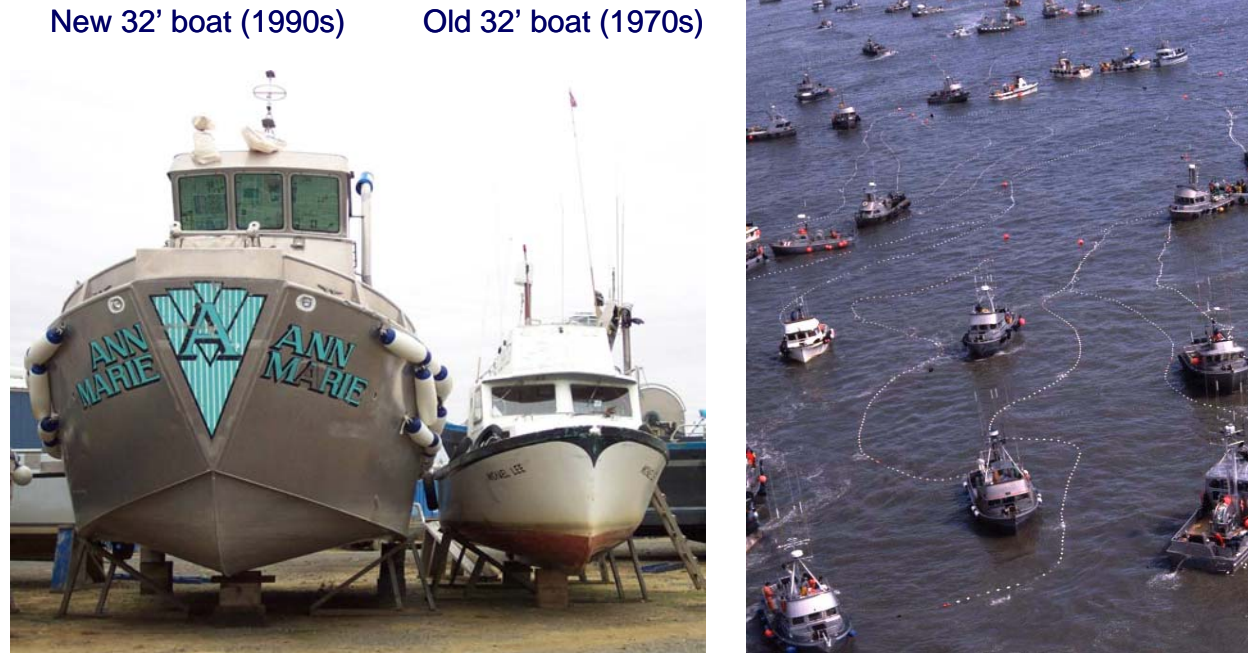


Figure 1. Rent dissipation in Alaska's Bristol Bay fishery: capital stuffing (left) and the race for fish (right). Photographs by Norm Van Vactor and Bart Eaton

Why might some fishermen not be better off under rights-based management? First, how fishermen will be affected by rights-based management depends critically on how rights are allocated. A harvester earning profits in a competitive fishery will very rationally oppose rights-based management unless he expects to receive a sufficient allocation to earn equivalent or higher profits. (Note that it is *not* true that no rents are earned in competitive fisheries; skilled fishermen can clearly earn significant rents even if less-skilled fishermen earn zero rents). Secondly, fishermen who are risk-seeking have a chance to strike it big with a highly profitable season in a competitive fishery but no such chance in a rights-based fishery. Third, some fishermen *enjoy* fishing competitively (and have told the authors so). These three reasons are not the only reasons; however they are particularly relevant to the subsequent discussion.

Regardless of the reasons, significant numbers of fishermen oppose rights-based management. Opposition from fishermen has clearly slowed or stopped the adoption of rights-based management in many countries. For example, in the United States, opposition to rights-based management was reflected in a Congressional moratorium on the establishment of new individual quota systems in federally managed fisheries between 1996 and 2002.

If the potential benefits of rights-based management approaches envisioned by economists are to be realized, it is important consider approaches to introducing rights-based management that might encounter less resistance from fishermen. In this paper, we discuss one such approach: voluntary transition to rights-based management.

### **VOLUNTARY TRANSITION TO RIGHTS-BASED MANAGEMENT**

For the purposes of this paper, we define the concept of “voluntary transition to rights-based management” as having these four characteristics:

- The competitive fishery must be limited entry—or entry must be limited as an initial step.

- The fishery is divided into two separate fisheries, each of which is allocated a separate aggregate share of the total quota. One of these is a rights-based fishery, in which harvesters fish for individual or group quotas. The other is a competitive fishery, in which harvesters compete in catching the total quota. The two fisheries may be divided temporally (fishing occurs at different times), spatially (fishing occurs in different areas), or in some other way.
- Harvesters may choose annually whether to participate in the rights-based fishery or the competitive fishery.
- The annual aggregate quotas of the two fisheries depend upon the number of harvesters choosing to participate in each fishery

The basic rationale for voluntary transition is as follows. The rights-based fishery generates higher rents per fish than the original competitive fishery. Even if those harvesters who choose the rights-based fishery are given a lower average allocation than their average harvests in the original fishery, they can earn higher rents per fish—making them better off. By giving the rights-based fishery a lower per capita allocation, harvesters who choose the competitive fishery can also be given a higher average allocation than they would have received in the original competitive fishery—making them also better off. Thus both the fishermen that choose the rights-based fishery and the competitive fishery can be better off—a “win-win” opportunity.

As an example, assume that there are 100 permit holders, and that  $R$  is .5, so that harvesters choosing the quota fishery receive only half the average allocation as harvesters choosing the competitive fishery. As illustrated in Figure 3, that the more harvesters who choose the quota fishery, the higher the average allocation which is possible in both fisheries. The blue (lower) line represents the average catch share of a quota permit, while the red (upper) curve represents the average catch share of a competitive permit.

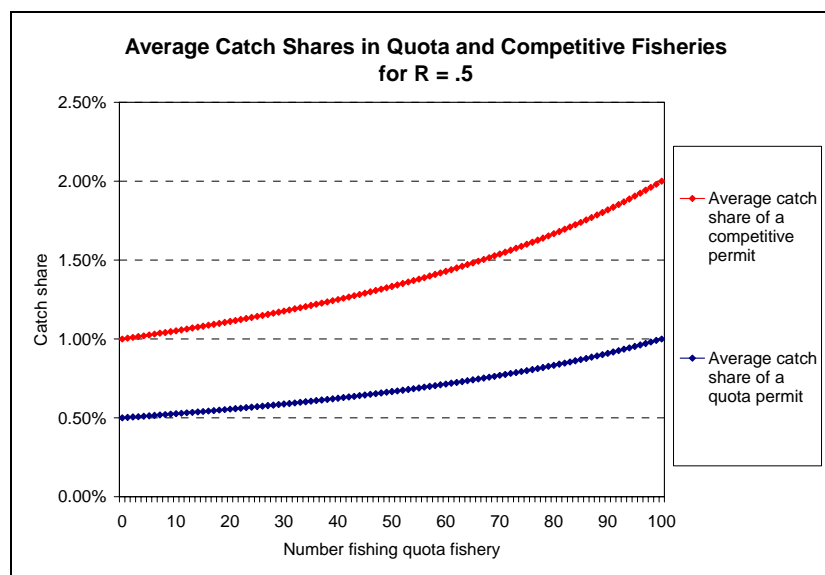


Figure 2

Assume next that 70% of potential profits are dissipated in competitive fishing, that 0% of potential profits are dissipated in quota fishing, and that harvesters would average \$100 in profits if all fish were harvested in a quota fishery. As shown in Figure 4, if harvesters who choose the quota fishery earn higher profits than harvesters who choose the competitive fishery, despite their lower catch allocations, because they dissipate fewer profits. This creates an incentive over time for harvesters to switch from the

competitive fishery to the quota fishery. As they do so, average profits increase for both fisheries—and for the combined fisheries.

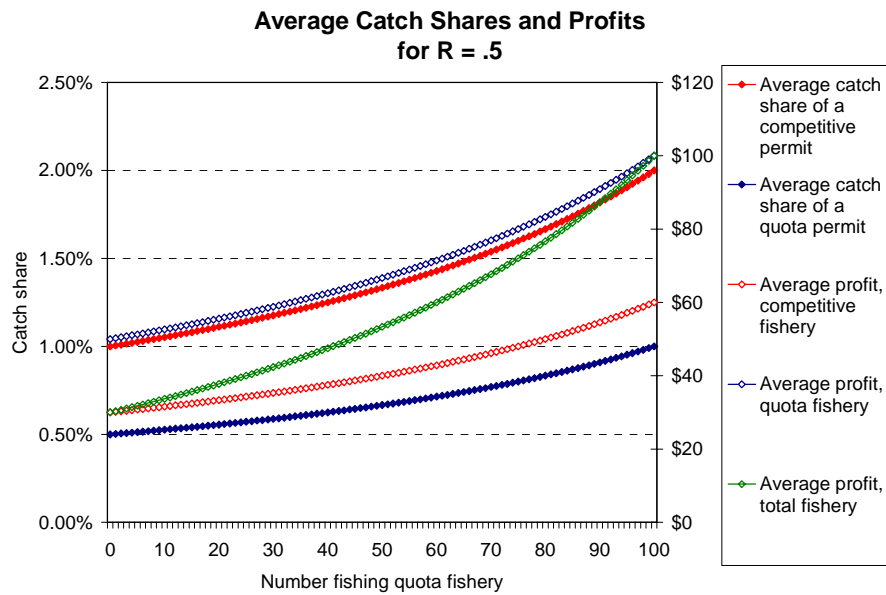


Figure 3

**EXPERIMENTAL METHODOLOGY**

To demonstrate and test the concept of a voluntary transition to rights-based management, we used an experimental methodology which we have been using for a variety of teaching and research applications at the University of Alaska Anchorage Experimental Economics Laboratory. In these experiments, participants simulate a fishery by actually “fishing”—albeit in a very simple way. In this fishery, the “fish” are beans in a large bowl on a table, and the “gear” options consist of measuring scoops of varying sizes. Harvesters “fish” by using the scoops to scoop fish out of the bowl into plastic pitchers on the floor.



Figure 4: Supplies for the Fishing Experiment

We have conducted numerous experiments with eight student subjects. Initially all subjects fish in a “competitive” fishery from one bowl, which contains 20 cups of beans (an average of 2.5 cups per subject). Subjects earn “revenues” of \$1 per cup of beans which they “harvested.” To fish, subjects need to purchase “gear” (scoops). They may choose one of seven scoops ranging in size from 1/8 cup to 1 cup. The rental cost of the scoop is proportional to the size of the scoop, at \$4.375 per cup of scoop size. Following the experiment, the subjects are paid real dollars proportional to the “profits” they earn in the experiment.

Note that given these rules, the most efficient gear choice would be for each of the eight subjects to use the lowest-cost 1/8 cup scoop, for a total cost of \$4.375, resulting in total profit of \$20.00 – \$4.375, or \$15.125. (This excludes the option of having only one subject use one 1/8 cup scoop and sharing the profit, which we do not invite or allow.)



Figure 5: Experimental subjects choosing gear prior to “fishing” competitively

At the start of the “season,” each subject chooses a single scoop to fish with. The fishery remains “open” until all the beans are harvested.

Fishing under these rules, subjects regularly exhibit “competitive” behavior characteristic of a classic derby fishery. They choose scoop sizes much larger than 1/8 cup, realizing (correctly) that those with larger scoops capture a much larger share of the harvest. This adds to total costs without adding to total revenues. They fish aggressively to scoop beans out of the bowl as fast as they can. In doing so, they spill a significant share of the total harvest while tossing beans into their pitchers. As a result, a large share of the potential profits are dissipated, and most subjects earn low or no profits.

When we replace the competitive fishery with a “quota” fishery, under which each subject receives an individual quota which he may harvest at his own pace, we observe dramatic changes in the “fishery.” After one or two seasons (not all subjects catch on immediately), subjects always choose the smallest and cheapest 1/8 cup scoop. They “fish” their quotas slowly and carefully and spill almost no beans.

We are planning to report elsewhere on these contrasting fishing behaviors under competitive and quota management, as well as a variety of other insights related to heterogeneity in fishing skill and the

evolution of gear choices over time. In the following discussion, we report only on the application of this experimental methodology to demonstrate and test the concept of a voluntary transition to rights-based management.

## EXPERIMENTAL DESIGN AND HYPOTHESES

We conducted eight experiments, with eight subjects per experiment. In each experiment, subjects fished sixteen seasons (rounds), as summarized in Table 1.

<b>Rounds</b>	<b>Scoop choice options</b>	<b>Competitive or quota?</b>	<b>Purpose</b>
1-3	Mandatory ¼ cup	Competitive	Test subjects' relative "skill"
4-7	Any scoop	Competitive	Observe cup choices, harvests and profits when all subjects fish competitively
8-16	Any scoop	Subjects may choose between competitive and quota fishery	Observe fishery choices Observe cup choices, harvest and profits in both fisheries

Table 1

In Rounds 1-3, all subjects fished competitively using a mandatory ¼ cup scoop. The purpose of these first three seasons was to let subjects gain familiarity with fishing, and to test their relative "skill" in fishing competitively. (We plan to report elsewhere on interesting differences which we observed in fishing skill and their relationship to gear choices and fishery choices in subsequent rounds.)

In Rounds 4-7, subjects competitively using whatever scoop they chose. During these four rounds, they exhibited classic characteristics of competitive fishing as described above. After Round 7 we offered subjects the following choice:

*"We will now divide the beans into two separate bowls. Before each round, you must decide the bowl from which you want to harvest. The amount of beans in each bowl will depend upon how many people choose to harvest from each bowl. The beans will be divided such that Bowl 1 always has 1¼\* times as many beans per person as Bowl 2.*

*The rules for harvesting at each bowl are also different. In Bowl #1 the rules will be exactly the same as the previous stage. The only differences may be the number of people harvesting from this bowl and the amount of beans in the bowl.*

*In Bowl #2, the rules will be different. Each person who harvests from Bowl #2 will be assigned a personal harvest quota. If you choose to harvest from Bowl #2, your harvest is limited to your personal quota; you may not harvest more than your personal quota"*

*\*This proportion, equal to 1/R as defined above, varied between treatments.*

In the remaining nine rounds (8-16) we observed how many subjects chose each fishery, and their gear choices, fishing behavior and profits in each fishery.

We conducted the experiment with two treatments with different values of R, as summarized in Table 2. Note that in treatment X, subjects choosing the competitive fishery received only slightly higher average

allocations. In contrast, in treatment X, subjects choosing the competitive fishery received much higher average allocations.

Treatment	Number of experiments	Ratio of beans per subject in Bowl 1 (competitive fishery) to beans per subject in Bowl 2 (quota fishery)	R
X	4	1.25	.8
Y	4	2.5	.4

Table 2

We hypothesized that we would observe the following.

- Given the option to choose between a competitive fishery and a quota fishery, some but not all subjects will choose the quota fishery
- Over time, the number of subjects choosing the quota fishery will increase
- Average gear use (harvest cost) will be lower in both the quota and the competitive fishery than in a competitive-only fisher
- Average profits will be higher in both the quota and the competitive fishery than in a competitive-only fishery
- These hypotheses will hold even for values of R significantly less than 1

## EXPERIMENTAL RESULTS

Below, we briefly summarize the experimental results, using graphs which show subjects choices by period (round or season), averaged over the four experiments in each treatment. Here we only summarize key findings of interest. We plan to report on these findings in greater detail elsewhere.

We hypothesized that “*Given the option to choose between a competitive fishery and a quota fishery, some but not all subjects will choose the quota fishery*” and “*Over time, the number of subjects choosing the quota fishery will increase.*” As shown in Figure 5, in both treatments some subjects chose the quota fishery. In Treatment X (with higher R of .8) the number of subjects choosing the quota fishery increased over time—reflecting the fact that average profits were higher for the quota fishery.

In contrast, in Treatment Y (with much lower R of .4) the number of subjects choosing the quota fishery did not increase over time. What is striking, however, is that even with the expectation of average harvests of only 40% of those for the competitive fishery, an average of between 2 and 4 subjects nevertheless chose to fish in the quota fishery.

We hypothesized that “*Average gear use (harvest cost) will be lower in both the quota and the competitive fishery than in a competitive-only fishery.*” This occurred for both the higher R fishery (Figure 7) and the lower R fishery (Figure 8). Not only was the quota fishery more efficient, but with fewer participants there was also less competitive pressure to choose a large scoop size in the competitive fishery.

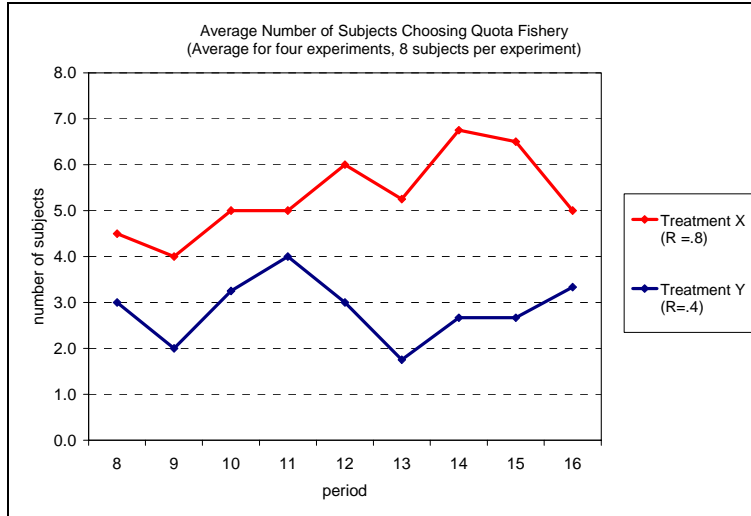


Figure 6

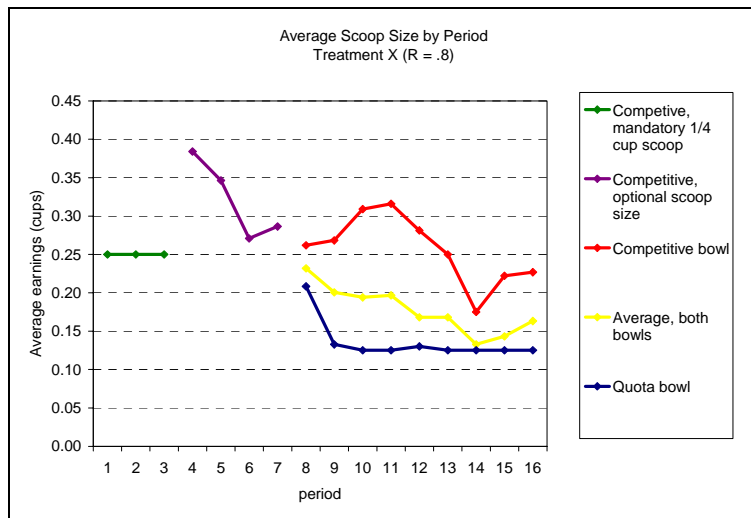


Figure 7

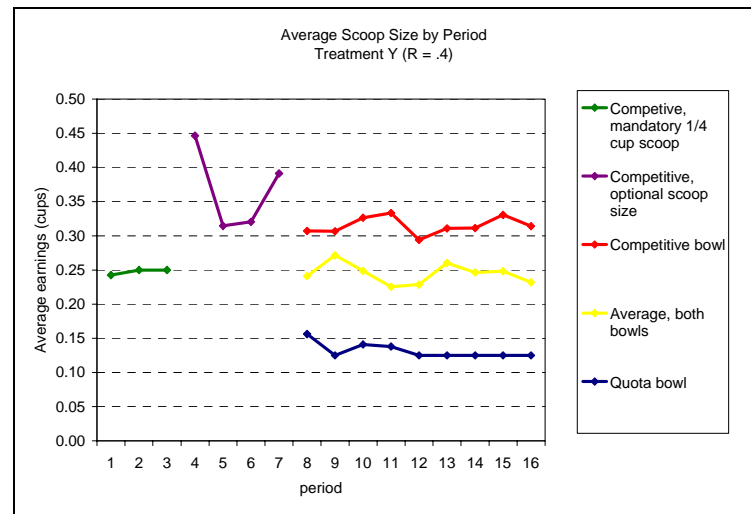


Figure 8



We hypothesized that “Average profits will be higher in both the quota and the competitive fishery than in a competitive-only fishery.” This was the case for both the higher R fishery (Figure 9) and the lower R fishery (Figure 10).

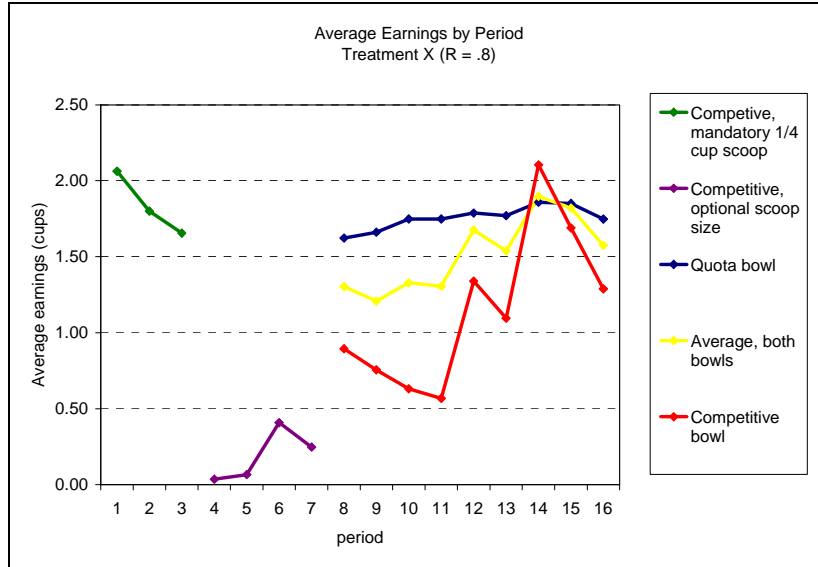


Figure 9

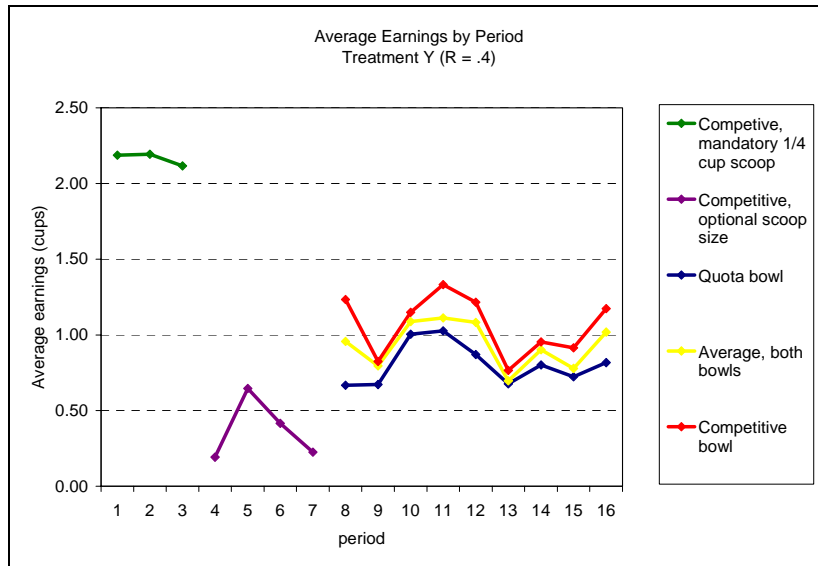


Figure 10

Finally, we hypothesized that “these hypotheses will hold even for values of R significantly less than 1”—as they did.

In summary, the experimental results supported our hypothesis that even with significantly lower allocations per harvester, at least some subjects chose the option to fish in a non-competitive allocated

fishery—thus reducing total costs in the fishery and increasing total profits, not only for those who chose the allocated fishery but also for those who continued to fish competitively.

### THE ALASKA CHIGNIK SALMON COOPERATIVE

The Alaska Chignik salmon cooperative represents an interesting and instructive example of an actual voluntary transition to rights-based management (Knapp 2008). The Chignik salmon fishery is a major Alaska sockeye salmon fishery with approximately 100 limited entry permit holders. The Chignik fishery provides ideal conditions for cooperative salmon fishing because all fish return through a protected lagoon to a single river.

Chignik permit holders had previous experience with cooperative fishing during strikes, but could not reach agreement on a 100% voluntary cooperative or imposition by managers of a mandatory cooperative. In order for those fishermen who wished to so to be able to fish cooperatively, co-op advocates proposed that the Board of Fisheries allocate a share of the total harvest to a voluntary cooperative, with the allocation to be determined based on the number of permit holders joining. The co-op and the “independent” fleet (permit holders who didn’t join the co-op) would fish in separate, sequential fishery openings. The proposal was implemented for four years until it was ended by Alaska Supreme Court decision that it violated a state requirement that limited entry permit holders be onboard when their permits are fished.

In each year, the majority of permit holders joined the co-op despite the fact that it received a lower average allocation per permit holder (Table 3).

		2002	2003	2004	2005
Allocation formula if total Co-op members is:	50 or fewer	No co-op allocation			
	51-84	0.90% per member*			
	85 or more	1.00% per member**			
Number of permits holders	Co-op	77	77	87	76
	Independent	22	24	13	23
	Total	99	101	100	99
Allocation of sockeye harvest	Co-op	69.3%	69.3%	87.0%	68.4%
	Independent	30.7%	30.7%	13.0%	31.6%
Allocation per permit	Co-op	0.90%	0.90%	1.00%	0.90%
	Independent	1.40%	1.28%	1.00%	1.37%

Source: Knapp, 2008. Note: Table excludes one independent permit holder who did not fish in 2002. \*For 2004 and 2005, the formula was 0.95% per co-op member if the number of members was between 80 and 84. \*\*The table assumes 100 permit holders. Technically the allocation was “one prorated share” per member if the Co-op had 85 or more members.

Table 3: Chignik co-op and independent fleet allocations

The estimated cost savings attributable to the co-op were substantial. While savings were most apparent for the co-op (Table 4), they also occurred for the independent fleet, which was able to catch its allocation in far fewer days (as permit holders were competing with far fewer other vessels on the fishing grounds).

		2002	2003	2004
Fishery ex-vessel value (\$000)		\$4,655	\$5,738	\$3,596
Assumed number of boats which would have fished a competitive fishery		85	85	85
Number of boats which fished for the Co-op		19	19	19
Number of Co-op boats which fished		22	24	13
Reduction in boats attributable to Co-op		44	42	53
% reduction in boats attributable to Co-op		52%	49%	62%
Cost savings (\$000)	Insurance, maintenance & fuel	\$1,232	\$1,176	\$1,484
	Crew and groceries	\$920	\$1,118	\$750
Cost savings as % of ex-vessel value	Insurance, maintenance & fuel	26%	20%	41%
	Crew and groceries	20%	19%	21%

Source: Knapp (2008). Note: Assumes average costs of \$28,000 per boat for insurance, maintenance and fuel and average cost of \$3500 per boat for groceries. Crew cost savings estimates assume that crew would have been paid a crew share of 30% of ex-vessel value net of 6% fish taxes in a competitive fishery, and that the decline in crew costs during the co-op years would have been proportional to the decline in vessels fishing--so that that crew would not have been paid more for catching more fish.

Table 4: Rough estimates of the potential magnitude of cost savings attributable to the Chignik co-op

Thus the Chignik co-op demonstrated that (1) an allocation to a voluntary rights-based fishery can provide an effective mechanism for achieving rights-based management and significant economic benefits, and (2) Sequential fishing is a relatively simple and efficient way of allocating a voluntary rights-based fishery organization.

However, the Chignik co-op also demonstrated some of the practical difficulties in voluntary approaches to rights-based fishing. One clear difficulty is that deriving a formula for allocating to a voluntary rights-based fishery is not easy. It is impossible to devise a “fair” allocation formula which will satisfy everyone. The Chignik co-op provided an example of the phenomenon—familiar to parents of multiple children—that treating two groups differently may result in neither group feeling satisfied. Both co-op and independent fishermen felt they were treated unfairly by the allocation formula and other aspects of the co-op. Arguments over these issues gave rise to new arguments over what people had said or how they had said it, dividing permit holders, communities and families.

## CONCLUSIONS

Theory, experimental evidence and practical experience all suggest that offering fishermen a choice between participating in a rights-based fishery and continuing to fish competitively may be an effective approach to facilitate transition to rights-based fishing. Voluntary transitions may become a “win-win” approach under which both groups become better off.

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