

AN EFFICIENT AND DISTRIBUTIONALLY NEUTRAL IFQ DESIGN

Xingguo Zhang, Washington State University, zxg@mail.wsu.edu
Scott C. Matulich, Washington State University, matulich@wsu.edu
Fred Inaba, Washington State University, inaba@wsu.edu
School of Economic Sciences
Washington State University
Pullman, WA USA

ABSTRACT

A two-stage, distributionally neutral and efficient rationalization policy design—one that preserves the *ex ante* wealth distribution—is developed by blending elements of a cooperative and a partnership. It is formally proven that there is no impediment to win-win rationalization using only IFQs allocated only to harvesters. The design creates a bilateral monopoly by allocating ITQs only to harvesters who, in Stage 1, join a “dissolution fishery association” (DFA) with the processor(s) through which their landed catch history arose. IFQ is allocated pursuant to a private contract that stipulates dissolution terms, much like a prenuptial. Harvesters that do not join a DFA with their traditional processor(s) must remain in open access. Bilateral negotiations focus on partitioning the total quasi rents of the DFA between a single processor and its traditional harvesters. The negotiated rent share split defines the terms of dissolution, i.e., the share of IFQs that must be left with the processor, if either party leaves the DFA for a preferred opportunity. The rent share split also defines a formula price contract for a functioning DFA. Stage 2 involves consolidation and realignment to maximize overall efficiency. Requirements of Stage 2 are stipulated.

Keywords: dissolution fishery association, IFQs, efficiency, formula price contract

INTRODUCTION

Distribution issues continue to threaten the advance of efficient, market-based environmental and natural resource policies. This observation is especially true in fisheries, where the incidence of benefits and costs of switching to IFQs are narrow and well known. Nevertheless, there has been little research into how policymakers can avoid unintentionally transferring processing sector wealth to harvesters.

Matulich, Mittelhammer, and Reberte [7] formally showed that the intended improvement in harvesting efficiency under a traditional, harvester-only individual transferable quota allocation often has two unintended collateral effects. There is a desirable improvement in processing efficiency, but wealth may be redistributed from processors to harvesters. The potential for this unintended redistribution of wealth to jeopardize adoption of ITQs was amplified by the U.S. Congress. In 1996, the Magnuson-Stevens Fishery Conservation and Management ACT (MFCMA) stipulated a four-year moratorium on new ITQs while the National Academy of Sciences explores “(H) mechanisms to ensure that vessel owners, vessel masters, crew members, and United States fish processors are treated fairly and equitably in initial allocations [5].”

Fisheries economists are loath to design win-win ITQ policies. It would seem that fishery economists trained in the tradition of Hicks and Kaldor are reluctant to address the inescapable distributional issues that lie at the heart of changing property institutions. This reluctance is perhaps due to the fact that

interpersonal utility comparisons cannot be scientifically established; value judgments about how policy benefits and costs should be distributed are outside the purview of objective economic analysis.

Ironically, almost no economic analysis is insulated from distributional matters simply because the analyst chooses not to address them. And invoking the potential compensation principle is cold comfort for those damaged by policy change. Moreover, it is irrelevant to political economy unless the burden of costs is diffuse, which certainly is not the case of the fishery. One has to wonder, then, why “doing distribution” by default is preferred to addressing distributional matters in a considered and thoughtful way that takes advantage of economists’ skills and insights that could result in better public policy.

Economics and economists can rely on something far more modest than interpersonal utility comparisons. Unless wealth redistribution is an explicit policy goal, economists’ contributions could and probably should strive to design policy that preserves the ex ante wealth distribution, i.e., design distributionally neutral policy.¹ That said, few studies integrate efficiency and distributional considerations in both the benefit and cost side of environmental and resource policy, in part because distributionally neutral analysis is difficult to implement [12].

We develop a distributionally neutral, market-based policy design in the context of commercial fisheries. The particular design involves the allocation of transferable fishing quota only to harvesters, while assuring processors participate in the economic benefit of rationalization.

The background section of this paper addresses the heart of the controversy and highlights a persistent misunderstanding. The analytical framework is then presented. The analysis section provides the results. Conclusions follow.

BACKGROUND

Matulich, Mittelhammer, and Reberte [7] speculated that either an allocation of harvesting quota to both sectors (one-pie split allocation) or a separate allocation of fishing quota (IFQ) and processing quota (IPQ) to each sector (a so-called two-pie allocation) might resolve the efficiency-distribution tension. Matulich and Sever [8] subsequently proved the existence of a Pareto safe or win-win, one-pie split of harvesting rights under perfect competition, but splitting IFQs between harvesters and processors was deemed “policy infeasible” because it was impossible for policymakers to define the precise split or range of splits due to lack of industry-wide variable cost data.

Despite proof of Pareto safety provided by a two-pie allocation, use of transferable IPQs raised concerns of antitrust risk and is viewed by some as a needlessly complicated way of balancing benefits. Yet, no substantive, analytically grounded recommendations have been made as to how one can advance win-win rationalization without the use of both fishing and processing quotas. And the suggestion that ex post compensation be paid to processors not only lacks political merit, it raises several obvious questions: Why are harvesters entitled to rationalization benefits, while processors are to be “just compensated?” Why not the reverse? How much compensation is “enough” and how would one determine that amount?

Firstly, this paper investigates whether there are barriers to a Pareto safe rationalization design without the use of processing quota. A policy-feasible, Pareto safe rationalization program must leave all heterogeneous participants in both sectors better off (or at least no worse off), even with the very real possibility that post-rationalization ex-vessel price can fall more than the efficiency gains of one or more vessels. Such vessels would be worse off. One contributing factor to this problem is that efficiency

¹ In cases where wealth redistribution is a part of the policy agenda, economists can employ their skills to help achieve these ends with the least sacrifice of economic efficiency.

rankings often change before and after rationalization. An efficient vessel in open access may become relatively less efficient in the post-rationalization policy state. Those attributes that help make a vessel efficient in an open access race for fish, e.g., horsepower and crew size, may make it relatively inefficient in a slower, rationalized fishery.

We examine a rationalization design that blends elements of a cooperative and a partnership. A schematic of the two-stage policy design is given in Appendix 1. IFQs are allocated only to harvesters who first join a so-called dissolution fishery association (DFA) with the processor(s) through which their landed catch history arose. In essence, the design is similar to a one-pie allocation that emulates a one-pie split *vis a vis* a negotiated dissolution agreement that must be signed as part of the DFA contract. Like all partnerships, one of the first elements to be decided is how to divide the assets that each party brings to the partnership, in the event the partnership fails or a better option exists for one or more of the partners. The assets brought into the DFA consist of the composite value of the ITQ, which is awarded conditionally to harvesters. The dissolution agreement stipulates the amount or share of IFQs that must be left with the processor, if either party terminates the partnership (leaves the DFA). The DFA contract is negotiated in Stage 1. The negotiation focuses on a rent share agreement and dissolution terms if any party opts to leave the DFA. Nash bargaining is the framework of this negotiation. If any or all members of the DFA cannot reach an agreement, the corresponding catch history remains in license-limited access. Both the harvester(s) and processor must forgo rationalization benefits on that catch history.

Stage 2 begins after forming the DFA. It is in this second stage that industry-wide efficiency is maximized by realignment and consolidation of DFA members. One of three different mechanisms that might be used to enhance efficiency in Stage 2 is examined.

ANALYSIS

Stage 1

It is convenient to think of a DFA as a partnership/cooperative coalition in which the members agree to share the benefits of rationalization, such that no party to the DFA contract can be worse off relative to their *status quo* quasi rents. This feature effectively defines a DFA as a bilateral monopoly—the centerpiece of this policy design. Conceptualization of cooperatives as bilateral monopolies has a long tradition [13, 14, 15 and 16]. And bilateral monopolies are fully equivalent to vertical integration, providing a formula price contract is used to split the joint quasi rents [1, 6]. Such an approach guarantees maximum joint profits.

DFAs are assumed to negotiate an internal, sector-wide share of the joint quasi rents such that

$$QRT_f^C = \lambda QRT^C \text{ and } QRT_p^C = (1 - \lambda) QRT^C. \quad (1)$$

where QRT_f^C and QRT_p^C denote the quasi rents captured by harvesters and the processor, respectively;

QRT^C is the DFA's total or composite quasi rent; and λ is the harvesters' share of the DFA's composite quasi rent. Distribution to the harvesting sector, therefore, must satisfy

$$\lambda QRT^C = \sum_{i=1}^n \{ [P^C - AVC(R_{fi}^C)] T^C R_{fi}^C - S^f (T^C R_{fi}^C - \omega_{fi}) \} + \sum_{k=n+1}^N S^f \omega_{fk}, \quad (2)$$

where ω_{fi} and ω_{fk} denote the IFQs for active and inactive harvesters, respectively, P^C is ex-vessel price in DFA, S^f is the internal IFQ quota trading price (i.e., S^f captures only the contribution value of fishing), $AVC(R_{fi}^C)$ is average harvesting cost of harvester i at daily harvesting rate R_{fi}^C in the DFA,

T^C is time (i.e., season length) in the DFA. In equilibrium, total harvest equals the total IFQ allocated to the DFA harvesters.

Substituting $\sum_{i=1}^n T^C R_{fi}^C = \sum_{i=1}^n \omega_{fi} + \sum_{k=n+1}^N \omega_{fk}$ into equation (2), we get

$$\lambda QRT^C = \sum_{i=1}^n [P^C - AVC(R_{fi}^C)] T^C R_{fi}^C. \quad (3)$$

Thus, the formula price contract that splits the joint quasi rents according to equation (1) is

$$P^C = \lambda P_p + (1 - \lambda) AVC(R_F^C) - \lambda AVC(R_p^C). \quad (4)$$

Eq. (4) is obtained from the condition for optimal processing and harvesting rates, $R_p^C = \sum_{i=1}^n R_{fi}^C$, the

definition of QRT^C , and the definition sector-wide average variable cost,

$$AVC(R_F^C) = [\sum_{i=1}^n AVC(R_{fi}^C) R_{fi}^C] / \sum_{i=1}^n R_{fi}^C, \text{ implied by eq. (2).}$$

This formula price contract shows that the ex-vessel price (P^C) is defined by three components. The first term is the harvesters' share of wholesale price (P_p); the second term is the portion of the sector-wide average harvesting cost ($AVC(R_F^C)$) that is covered by the processor; the third term is the portion of the of the processor's average cost ($AVC(R_p^C)$) that is covered by the harvesters. The first and third terms in eq. (4) are adjusted for product recovery. Thus, the formula price contract reflects the relationship between ex-vessel price and DFA cost structure. For example, when weighted sector-wide average variable harvesting costs rise more than the weighted average variable processing costs, ex-vessel price adjusts upward to reflect the change in relative cost structure, so as to maintain a constant composite quasi rent split. Note that eq. (4) is conditional on the equilibrium quota value

$$S^f \in [P^C - AVC(R_{f_{n+1}}^C), P^C - AVC(R_{f_n}^C)].$$

An equivalent representation of the formula price contract in eq. (4) is

$$P^C = \lambda * UQRT^C + AVC(R_F^C). \quad (5)$$

This version reveals that a formula price contract is ostensibly a cost-plus pricing mechanism. Ex-vessel price equals the average harvesting costs plus the harvesters' share of composite, total unit quasi rents. Like the former representation, ex-vessel price adjusts so as to maintain the historic or negotiated distribution of quasi rents.

The formula price contract recognizes that a DFA operates like a vertically integrated firm. Implementation requires only that costs are mutually agreed upon or that an audit is done, from time to time. Overstating variable costs is the way either side can change the agreed upon share distribution. Ex-vessel price is never negotiated.

Proposition. There exists an interval of $\lambda \in [\underline{\lambda}, \bar{\lambda}]$ such that the split rule specified by

$\lambda = QR^O / QRT^O = QR^C / QRT^C$ guarantees every firm (including all the harvesters and the processor) is Pareto safe.

$\underline{\lambda}$ denotes the minimum harvester share, at the equilibrium ex-vessel price (P^C) and quota price (S^f), that assures every harvester is Pareto safe. $\underline{\lambda}$ is defined by the marginal active or inactive harvester who gains the least from rationalization. In contrast, $\bar{\lambda}$ is defined by the processor being no better off. Since there is only one processor in the DFA and the processor is guaranteed its full share of UQRTC; any value in the interval leaves the processor Pareto safe.

This proposition theoretically supports the feasibility of the DFA design such that each firm is better off or at least no worse off. The unique DFA framework simplifies the bilateral monopoly context examined in [8]. Rather than negotiating among all harvesters in the fleet and all processors, contract/dissolution negotiations between a single processor and its traditional harvesters avoids the identification problem Matulich and Sever encountered. The DFA functionally behaves like a vertical integrated firm, such that efficiency is guaranteed.

Corollary. Provided λ is chosen such that $AVC(R_P^O) - AVC(R_P^C) \geq P^C - P^O \geq 0$, each firm is Pareto safe. In particular, P^O is a Pareto safe solution (P^O is the ex-vessel price in open access).

This corollary addresses the possibility that ex-vessel price might drop more than the efficiency gain of one or more of the harvesters. By choosing the quasi rent split such that $P^C \geq P^O$, efficiency gains guarantee all firms benefit from rationalization. Ex-vessel prices greater than P^O enhance the rationalization benefits for harvesters.

The corollary suggests a simple approach to guaranteeing Pareto safety. Rather than negotiating the split rule, λ could be set at its historical level, λ^O . Then, whenever $P^C < P^O$, ex-vessel price could be set at $P^C = P^O$, avoiding the possibility that any harvester might be made worse off. The distribution of net benefits would change (i.e., $\lambda^C > \lambda^O$) but all firms would still benefit, including the processor. This approach to cooperation may be simpler than negotiating $\lambda \in [\underline{\lambda}, \bar{\lambda}]$ because both λ^O and P^O are known.

Providing the outside option in Stage 1 is punitive, harvesters and their processor are motivated to form a DFA, through which a win-win allocation of ITQ can be achieved. Both harvesters and their processor must agree on how to split the total quasi rents and the dissolution terms. Once a DFA is formed through a privately negotiated contract, IFQs are allocated to the harvesters according to their catching history. The harvesters must deliver their catch to their DFA processor or they must dissolve their association with that processor in order to deliver to a different processor or to sell their post-dissolution quota to a buyer not affiliated with the original DFA.

We approach negotiations in the cooperative-like DFA structure by applying Nash bargaining.

$$\begin{aligned} & \max \left(QR_F - QR_F^{OP} \right) \left(QR_P - QR_P^{OP} \right) \\ & \text{s.t. } QR_F + QR_P = QRT^C \end{aligned} \tag{6}$$

where: QR_F^{OP} and QR_P^{OP} represent the punitive outside option quasi rents that the harvesters and the processor capture in the event of negotiation failure; QRT^C represents the composite or total quasi rent produced in the DFA. Harvesters are assumed to bargain as a single, limited antitrust exempt bargaining unit. Each harvester receives the maximum rent share when all agree to a consensus rule.² The solution to eq. (6) determines the respective shares of the total quasi rent. Both sector-wide individual Pareto safety is guaranteed by eq. (6).

Stage 2

Once harvesters and their traditional processor form the initial DFA, quota is allocated. Then, either may face incentives to dissolve their association and defect. This dissolution occurs in Stage 2. Defecting harvesters, for example, may auction off their residual IFQs at the composite harvesting and processing value. If the defecting harvester is relatively more efficient than the least efficient active harvester in the acquisitive DFA, the defecting harvester may be invited to join the acquisitive DFA. This relatively efficient harvester would receive two distinct payments—one for the dissolved, composite-valued quota and a separate payment for its efficiency contribution to the acquisitive DFA. This second payment is like a Richardian rent for the steel (the vessel). We now illustrate the Stage 2 process for a single defecting vessel, which we label harvester f_O . The original DFA is labeled DFA1 and the acquisitive DFA is labeled DFA2. While there are three distinct ways to decide whether realignment is beneficial to all parties, we consider only one here. We fix the Stage 1 quota split that applied in DFA2, and allow ex-vessel price and the internal DFA2 fishing quota price (S^{f2}) to vary. The other approaches, fixing ex-vessel price and renegotiating the split, have similar outcomes, though these are not addressed in this paper. The following assumes willingness of DFA2 to purchase the CVQ from f_O , and addresses the conditions under which f_O will be invited to join DFA2.

Fixed quota split. When harvester 0 enters DFA2, we fix the original DFA2 split determined in first stage; ex-vessel price will adjust accordingly. The new ex-vessel price in DFA2 is

$$P_2^{NC} = P_2^C - (1 - \lambda_2) \Delta \left(\frac{R_{fo}^*}{R_{P2}^*} \right) \quad (7)$$

where: P_2^{NC} is new ex-vessel price, P_2^C is the original ex-vessel price, λ_2 is the split of DFA2 determined in first stage, and $\Delta = AVC(R_{fn}^*) - AVC(R_{f0}^*)$ is harvester 0's contribution to DFA2's efficiency.

An active harvester i is better off if

$$\begin{aligned} & \left[P_2^C - AVC(R_{fi}^*) \right] (Q_{i2}^{C2+} - Q_{i2}^{C2}) \\ & \geq (1 - \lambda_2) \Delta \left(\frac{R_{fo}^*}{R_{P2}^*} \right) Q_{i2}^{C2+} + (S^{C2+} Q_{i2}^{C2+} - S^{C2} Q_{i2}^{C2}) - Q_{i2} (S^{C2+} - S^{C2}) \end{aligned} \quad (8)$$

² The marginal active and/or inactive harvesters will define the Pareto safe conditions, in the sense that each is most difficult to lave no worse off. This observation implies that all other harvesters benefit more from assuring the marginal vessels are Pareto safe.

where: S^{f2+} (S^{f2}) is quota price after (before) harvester 0 enters, Q_{i2}^{C2+} (Q_{i2}^{C2}) is its total catch after (before) harvester's entry, Q_{i2} is the original allocation to harvester i in DFA2. Eq. (8) says that if the increase in quasi rent due to extra catch can offset the loss incurred by the drop in ex-vessel price (due to lower $AVC(R_F)$ and the associated change in quota price, harvester i will be better off.

An inactive harvester j is Pareto safe if

$$S^{f2+}Q_{j2} > S^{f2}Q_{j2} \quad (9)$$

where Q_{j2} is the allocation of IFQ to harvester j .

Eqs. (8) and (9) jointly define the condition under which the original firms in DFA2 are better off or at least no worse off after harvester 0's entry. If these conditions are not met, the harvesters in DFA2 will block entry of harvester 0. Harvester f_0 is willing to join DFA2 if the CVQ value plus the steel value exceeds its reservation value earned in DFA1.

CONCLUSION

Simply allocating IFQ to both harvesters and processors cannot, by itself, assure Pareto safe rationalization. Nevertheless, we have formally shown that there is no impediment to Pareto safe rationalization using only IFQs, providing an institutional framework is established that:

1. recognizes the composite value of quota is the sum of harvesting and processing contribution values;
2. liberates industry to reorganize and operate in its self-interest, and at the same time, maximize net national benefits while distributing the benefits to all prior stakeholders; and
3. encourages cooperative behavior by assuring the outside option is sufficiently adverse to both harvesters and processors.

The two-stage dissolution framework examined in this paper simplifies the context examined by Matulich and Sever (1999). Rather than negotiating among all harvesters and processors, the approach focuses on how to partition the total quasi rents between a single processor and its traditional harvesters. The harvesters presumably would organize into a limited anti-trust exempt, bargaining cooperative for the purpose of this negotiation. This bilateral negotiation avoids the identification problem Matulich and Sever encountered. Thus, a formula price contract that partitions the composite quasi rents plays a key role in the design. A formula price contract based on the open access distribution of composite or joint quasi rents is a vehicle for avoiding price disputes, while assuring efficiency. Other distributions are also shown to assure Pareto safety.

The negotiated distribution between harvesters and processors (λ and $1-\lambda$, respectively) occurs in Stage 1 and serves two functions in this policy design. First, it splits the composite or joint quasi rents between the processor and the associated vessels, while the fishery association is functioning. Second, the split also defines the dissolution terms, in the event one or more of the association members elects to exit the association in Stage 2. Vessels that elect to leave the association would retain λ -share of their initial IFQ allocation, which could be sold at its composite value (the sum of harvesting plus processing quasi rents); processors would retain $(1-\lambda)$ -share of the initial IFQ allocation, also fully valued. Such a rent-share split and dissolution split are proven to be Pareto safe for all participants. Operationally, the IFQ could be converted to CVQ (composite valued quota) upon dissolution. CVQ is never again subject to dissolution terms.

The dissolution approach to achieving a win-win split relies on subsets of industry participants knowing their own quasi rents—their own Pareto safe reservation prices—and then behaving rationally. Policy makers are removed from making untenable, top-down IFQ split allocations. The framework also corrects the deficiency of AFA-style cooperatives identified by Matulich, Sever, and Inaba, through an association structure that does not distort relative contribution values of quota.

A sufficiently adverse outside option is essential to encourage all parties to bargain in good faith and to join the dissolution fishery association. Without this feature, remaining in open access without quota could be deemed more attractive to the inside option if: a) the vessel has a relatively small catch history and expects a greater catch in open access; b) the vessel expects to receive a sufficiently higher (harvester-only) ex-vessel price that would occur with the formation of at least one dissolution fishery association; and or c) open access vessels can form a limited anti-trust exempt cooperative, segmenting the open access pool and thereby, achieving a *de facto* harvester-only quota allocation. Failure to create an adverse outside option would promote predatory behavior, where harvesters capture both harvesting and processing quasi rents. Nash bargaining is an appropriate game construct, given the adverse outside option.

Industry-wide efficiency is maximized in the second stage, when DFA members consolidate and realign. Harvesters/processor with superior Stage 2 options will dissolve their initial DFA relationship and either: 1) sell their full-valued CVQ to a member(s) of a different DFA; 2) fish their CVQ, delivering it to a different processor/DFA; or 3) join a different DFA but only if the defecting vessel contributes to the overall efficiency of a different DFA. We specify the conditions under which each of these three options may occur.

REFERENCES

- [1] Blair, R., and D. Kaserman, 1987, A Note on Bilateral Monopoly and Formula Price Contracts, *American Economic Review*, 77 (3), pp. 460-63.
- [2] Bromley, D.W, 1990, The Ideology of Efficiency: Searching for a Theory of Policy Analysis, *Journal of Environmental Economics and Management*. 19, pp. 86-107.
- [3] Brown, G.M. 2000, Renewable Natural Resource Management and Use without Markets, *J. of Economic Literature* (XXXVIII), pp. 875-914.
- [4] Gordon, H.S. 1954, The Economic Theory of a Common Property Resource: The Fishery, *Journal of Political Economy* 62 (2), pp. 124-42.
- [5] Magnuson-Stevens, Fishery Conservation and Management Act as Amended through 1996, 16 U.S.C 1801.
- [6] Matulich, S.C., R.C. Mittelhammer, and J.A. Greenberg, 1995, Exvessel Price Determination in the Alaska Red King Crab Fishery: A Formula Price Contract Under Uncertainty? *J. of Environmental Economics and Management* 28, pp. 374-87.
- [7] Matulich, S.C., R.C. Mittelhammer and C. Reberte, 1996, Toward a More Complete Model of Individual Transferable Fishing Quotas: Implications of Incorporating the Processing Sector, *J. of Environmental Economics and Management* 31, pp. 112-28.

- [8] Matulich, S.C. and M. Sever, 1999, Reconsidering the Initial Allocation of ITQs: The Search for a Pareto-Safe Allocation Between Fishing and Processing Sectors, *Land Economics* 75, pp. 203-19.
- [9] Matulich, S. C., M. Sever, and F. Inaba, 2001, Fishery Cooperatives as an Alternative to ITQs: Implications of the American Fisheries Act, *Marine Resource Economics* 16, pp. 1-16.
- [10] Munro, G.R, 1982, Bilateral Monopoly in Fisheries and Optimal Management Policy, *Essays in the Economics of Renewable Resources*, L.J. Mirman and D.F. Spulber, eds, Amsterdam, North-Holland.
- [11] National Research Council, 1999, *Sharing the Fish: Toward a National Policy on Individual Fishing Quotas*, The National Academies Press, Washington D.C. 422p.
- [12] Parry, I., H. Sigman, M. Walls, and R. Williams III, 2005, *The Incidence of Pollution Control Policies*, Discussion Paper 05-24, Resources for the Future. Washington D.C.
- [13] Sexton, R.J. 1994a, A Survey of Noncooperative Game Theory with Reference to Agricultural Markets: Part 1. Theoretical Concepts, *Review of Marketing and Agricultural Economics* 62, pp. 11-28.
- [14] Sexton, R.J, 1994b, A Survey of Noncooperative Game Theory with Reference to Agricultural Markets: Part 2. Potential Applications in Agriculture, *Review of Marketing and Agricultural Economics* 62, pp. 183-200.
- [15] Staatz, J.M, 1989, Farmer Cooperative Theory: Recent Developments, United States Department of Agriculture, Agricultural Cooperative Service, Report No. 84, Washington DC.
- [16] Torgerson, R.E., B.J. Reynolds, and T.W. Gray, 1998, Evolution of Cooperative Thought, Theory, and Purpose, *J. of Cooperatives* 13, pp. 1-20.

Appendix 1

Dissolution Fishery Association Two-Stage Partnership Process



