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Industry Participation and Fishery Management Performance

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Landings of West Coast (California, Oregon, Washington) groundfish rose rapidly after MFCMA implementation and peaked in the early 1980's. Trawl gear accounted for the majority of volume landed, followed by long-line and pot gear. By mid-decade the combination of large fleet capacity and fully exploited stocks led to progressively more restrictive limits on selected groundfish species. Average earnings declined²². In addition, proposed plans to limit access in Alaska fisheries created the threat of more capacity entering the West Coast fishery from displaced Alaskan vessels²³. Fears of further reduced individual landings led industry members to call for a cap on capacity in the fishery²⁴.

In 1987 the PFMC created the Limited Entry Committee (LEC) and charged it with developing a license limitation program to address the problem of overcapacity. The committee's charge included the definition of initial program philosophy and design. The LEC included eight fishermen, a processor, a marine extension agent, a legal advisor, and a fishery enforcement advisor²⁴. Care was taken to represent all segments of the groundfish fishery and committee members were charged with ensuring that their contributions represented all points of view in their sectors. The major challenge facing the committee was change in philosophy which limited access represented. Although fishery regulations themselves had implicitly regulated access to the fishery, the act of explicitly limiting access challenged many industry members' traditional views of the fishery as an open frontier. For the plan to succeed, it needed a strong constituency.

The established practice of using industry participation in management served the Council well in the development of the program. By the time the Council voted on the license limitation program (Amendment 6 to the Groundfish Plan) in 1991, eight different *ad hoc* and three standing advisory committees had participated in the development, review and modification of the plan. A Technical Advisory Group consisting of four economists and three biologists assisted the Limited Entry Committee with analysis and technical advice. These committees were followed by a Limited Entry Ad Hoc Committee which incorporated public comment to further refine the plan, a Limited Entry Workshop Committee, which conducted industry education workshops on limited entry, the Limited Entry Oversight Committee, which reviewed alternative proposals, the Limited Entry Workshop Team, which conducted workshops on the proposed plan, the Limited Entry Drafting Committee, which translated the plans into regulatory language, and the Ad Hoc Technical Review Committee, which reviewed the draft regulations. Industry members served on five of the eight *ad hoc* committees. The three standing groundfish advisory committees (GAP, GMT, and SSC) also reviewed and commented on plans as they developed²⁴.

At different points in the process, these committees dealt with all matters related to program design and development: e.g., included vs. exempted gears, permit system structure, qualification criteria, the qualifying window period, and transfer conditions. Fishermen and processors were members of four of the eight committees. In addition, the strong involvement of fishermen's organizations in committee meetings reinforced the committees' work.

Committee members paid close attention to issues of equity. Potential social and

economic impacts of various program configurations were analyzed at several steps of program design. Because program development was largely the responsibility of industry representatives, and because program benefits and costs would accrue to industry members, members had a stake in the outcome. The "ownership" created legitimacy for the program which was critical to its eventual acceptance. Legitimacy depended on adequate representation, without which the process would have been paralyzed by constant intergroup squabbles and challenges to decisions.

The license limitation program for trawl, pot and long-line gears was adopted in 1991 and implemented in 1994 after a series of challenges by excluded fishermen to the qualifying window period and qualification landings threshold. In addressing these concerns, sensitivity to equity issues led to an initial allocation of licenses too large to immediately decrease fishing capacity. However, the program was effective in capping the increase in capacity. The program produced other outcomes as well. It formally defined the qualified harvesters in the fishery, dispensing with the traditional view of groundfish as a "sink" fishery available to absorb displaced effort from other fisheries. Industry views of the fishery were transformed from the open frontier to a restricted resource. The number of committees used throughout the plan development and review process spread industry participation over a large number of people, allowing maximum industry input into the plan. The committee deliberations combined with workshop presentations helped educate Council members and the industry at large about the complex structure of the West Coast groundfish fishery and about the properties of limited-access programs.

3.2.2 Inter-gear sablefish allocation

Sablefish (*Anoplopoma fimbria*) have been landed on the West Coast since at least the early 1960's²². Sablefish are targeted by pot gear and longline gear ("fixed gear") and are one of the many species caught by trawl gear as they fish on assemblages of groundfish. By 1980 developing markets led to increases in landings which continued through 1985. In 1985 the Council was faced with the need to limit overall landings of sablefish, made difficult by the fact that sablefish were caught at different times and in different manners by the major gear groups.

The trawl and fixed-gear groups also had different objectives for their use of sablefish. Trawlers caught sablefish as one component of a targeted catch assemblage, and preferred to use trip limits to pace landings out throughout the fishing year in order to maintain mixed-species operations. Fixed-gear groups were targeting sablefish for a largely export market²⁵. Some of the larger fixed-gear vessels were also fished in Alaska fisheries and their owners preferred to catch as much as possible on the West Coast early in the season before moving operations to Alaska. In the short run the olympic fishery benefitted the large boats which could outcompete small boats for catch.

The objectives of the major groups targeting sablefish were incompatible with a single quota. Recognizing the need to address different industry objectives, the Council decided to

establish gear-specific quotas of sablefish. Initial gear allocations were made by emergency action in 1986 on the basis of historical shares²², but the rapidly expanding fixed-gear sector felt disadvantaged by the split. In 1987 the Council established the Groundfish Select Group (GSG) consisting of an equal number of trawl and fixed-gear representatives. The GSG was charged with reaching agreement on management goals for the sablefish fishery and on sablefish quota allocation between trawl and fixed gear²⁶.

Throughout the four years of its existence, the GSG was never able to reach consensus on the appropriate division of sablefish quota allocation between trawl and fixed gears. The allocation of a shrinking quota between gear groups was a negative-sum exercise that meant losses were inevitable unless even larger losses were incurred by the other group. Expectations about the appropriate management approach for sablefish were polarized. Equity issues related to "fair share" were unable to be addressed because each gear group held different views of what was fair based on the way it had developed. Despite the Council's past successes in the use of industry participation the GSG was unable to fulfill its charge, leaving the decision in the hands of the Council. The GSG was disbanded in 1990. Since 1989 the allocation has been stable at 58% trawl, 42% fixed gear, with an Economic Analysis (EA) process required to change the allocation^{26,27}.

3.2.3 Fixed-Gear Sablefish Individual transferable quotas

The desire of the fixed-gear sablefish fishery to avoid trip limits and maintain an olympic fishery led to the predictable outcome²⁸. Growth of harvesting capacity combined with an open fishing season resulted in rapidly diminishing season length. In 1989 the fixed-gear sablefish season lasted six months. By 1993 the season had declined to three weeks in length²⁷. In addition, implementation of the license limitation program required allocating a portion of the sablefish quota to the small open access (exempted gear) fishery maintained under the program, further reducing quota size to trawl and fixed-gear groups.

In response to growing fixed-gear concern about the shortened seasons, the Council agreed to examine the possibility of an individual quota program which would guarantee a fixed share of the harvest to qualified fixed-gear fishermen. In April 1992 the Council appointed the Individual Quota Industry Committee (IQIC). The Committee's charge was to design individual quota programs for both the halibut and fixed-gear sablefish fisheries²⁹.

The Committee composition roughly represented that of the fixed-gear sablefish and halibut fleets. Representation categories reflected the major geographic and gear segments of the industry. In the interest of efficiency the committee was limited to 10 fully vested members ("A" permit holders) of the Groundfish License Limitation Program. This restriction excluded non-owner fishermen (hired captains and crew) from the committee as well as all other types of l.l. permit holders (provisional or temporary permits) and participants in the small open-access fishery²⁴. In a departure from the usual process of advertising for interested parties to submit applications, the committee was appointed through expressed interest on the

part of various industry members³⁰. Each appointee was asked to ensure that they represented all individuals falling within the designation of their seat²⁹.

The industry committee had an enforcement liaison assigned, and was provided the analysis and technical advice services of the Groundfish Management Team. The committee's work was placed on a fast track to concentrate on the development of a sablefish program, temporarily putting aside plans for a halibut program. By March of 1993 the Committee had finished the basic design and conceptual scope of the program for fixed-gear sablefish and had . Budget and time pressures led to the disbanding of the committee before many program details were worked out, leaving many of the details to be worked out on the Council floor.

Initial expectations were that the development of the fixed-gear individual quota program would proceed smoothly. It was thought by many that the long development process of the license limitation program had resolved many of the qualification issues that the individual quota program would have to address. In addition, analysis conducted to assess impacts of the license limitation program provided detailed information on groundfish industry structure which could be used for IQ program design. Prior development of an individual quota program in the North Pacific provided a model from which to build a West Coast program.

As program development progressed, it became apparent that there were weaknesses in both the plan and the process. Committee membership was considered unrepresentative by some parts of the industry. The rapid development process shortened the time period of education and consultation for the industry at large. Uncertainty about the effects of individual quotas created a nervousness about its rapid implementation. Estimated high levels of enforcement costs created concern about program benefits relative to costs. Because ITQ's would be limited to only the fixed-gear sector of the fishery, the expected efficiency benefits of a quota market would be limited. The Council would still be faced with the need to allocate sablefish between the fixed gear and trawl gear sectors.

The ability to use quota share as equity and to trade it on a market created further concerns about ownership and concentration. Concern about quota concentration and corporate ownership, although addressed in the program's rules, continued to be raised.

The program as developed failed to address many of the underlying concerns about equity, concerns common to other IQ programs¹⁴. Uncertainty existed about the extent to which the program would adapt to changing conditions in the fishery. Concerns were raised about incentives in an IQ program to discard and bygrade , undermining stewardship goals. Some members of the license limitation program who qualified for groundfish permits but would not qualify for sablefish quota share objected to the exclusion³¹. Responding to these concerns, the Council voted in October 1994 to delay the program indefinitely³².

Perhaps the most important equity issue underlying individual quotas as a management tool is the question of resource ownership. In their creation of quasi ownership over shares of

fish quota, ITQ's confuse the traditional definition of the fishery as 'public property. The ITQ development process came fast on the heels of the license limitation program, leaving little to no time to adjust to one new property rights regime before a second was superimposed.

4. EFFECTS OF INDUSTRY PARTICIPATION ON PERFORMANCE VARIABLES

Industry participation in the three case studies resulted in different effects on equity, stewardship, resilience and efficiency. The reasons for these differences provide insight into the role industry participation plays in fishery management performance.

4.1 Equity

Table 1 compares the extent to which the three programs adequately accounted for equity concerns related to representation of interests, a transparent decision process, consistent expectations about management goals, and the distributive results of actions. A plus is assigned if participation had an overall positive effect on the attribute. A minus is assigned if the participation had a negative effect. A +/- is assigned if the effect of participation was mixed.

Table 1 about here

Of the three processes, the license limitation program was the most successful in making positive contributions to equity issues. It fulfilled the need for thorough representation of interests through the diverse committees on which industry members served and through an extensive series of educational workshops at which non-committee industry members could voice their concerns. The development and review process evolved slowly and was conducted over a widespread geographic area, increasing understanding of the process being followed. The common threat of "outside" capacity entering the fishery combined with the long period of industry interaction on the various committees helped homogenize the diverse expectations of industry members into a common goal. Initial qualification standards were deliberately kept low to accommodate many sizes of operations, easing concerns about rent capture by the fishery's largest producers. However, some lingering fear about permit concentration remains.

The inter-gear allocation of sablefish fared less well in its contribution to equity. Major industry interests were adequately represented on the committee. The process by which those negotiations were to proceed was clear to participants, but allocation criteria were often unclear. Each gear group brought into the process its own expectations about what it would gain from negotiations, and within each gear group there were differences in the scale of operations that further diversified expectations. Concerns about the distributive effects of the allocation were never resolved. Each group realized that the zero-sum nature of the allocation precluded a win-win outcome.

The sablefish ITQ process was fraught with equity concerns that were never resolved. Committee representation was not considered adequate by many excluded groups which later became sources of pressure to defeat the program. The design and development process was rapid, leaving people outside the process confused about its operation. Diverse motivations and expectations within the fixed gear fleet were never resolved. Uncertainty about the program's impacts led to enduring concern about the possibility of concentration of quota share and rent capture. In the end, unaddressed equity concerns about the ITQ program were important contributors to its failure.

4.2 Stewardship

Table 2 summarizes the extent to which each of the three processes contributed to the stewardship elements of a lengthened time horizon, monitoring of behavior, and enforcement of rules.

 Table 2 about here

Of the three processes, the license limitation process contributed the most to stewardship issues. The vesting of industry members with marketable permit rights increase the level of certainty about a right to long-term tenure in the fishery. The tiered permit system created different levels of access for different categories of operators which could have lead to increased costs of monitoring fishing. However, these difficulties were avoided because the system fit into the existing pattern of license validation and landings certification. Enforcement of landings under the permit system were expected to remain unchanged or decline²⁴.

The inter-gear sablefish allocation process posed no particular problems for monitoring and enforcement. Monitoring each gear group's quota could be tracked through cumulative landings records. The problem for stewardship created by the process was the uncertainty about future allocations to each group and the process which would be followed. Creating the negotiation process itself created strategic incentives to increase within-sector sablefish landings as quickly as possible to enhance the negotiating position.

The fixed-gear ITQ process addressed one stewardship element extremely well. Assignment of quota share, a much more specific assignment than a permit to fish groundfish, created an expectation of tenure over the access right to sablefish which would terminate only upon sale. However, incentives for cheating inherent in any output limited fishery work against stewardship of the resource. The ex-vessel price of sablefish varies with the size of fish. Quota share is expressed in weight. Incentives are strong to maximize the value of the allowable landed weight by hygrading the catch for the largest most valuable fish. Since hygrading and discarding takes place at sea, monitoring of such behavior is difficult and costly, requiring either a higher level of at-sea enforcement, increase of violation penalties, or

more complicated monitoring of landings data for size composition of landings.

4.3 Resilience

Table 3 summarizes the extent to which each of the three processes contributed to management resilience through rule flexibility, adaptation to structural change in the industry such as technological change, and adaptation to changes in markets.

 Table 3 about here

The license limitation program is complex and detailed. Complexity limits its flexibility in rule changing. As an amendment to the Groundfish Plan, changing any of the rules requires the entire process of scoping, public hearing and impact analysis²⁰ (MFCMA). Because it allows for the sale of permits, the program is fairly adaptable to changes in technology, industry structure, or markets. A provision for combining permits on a single vessel allows for increasing the size of individual operations, and permits may always be used on vessels smaller than those permitted.

The inter-gear allocation of sablefish is a negotiation process that creates extreme flexibility of rules. That flexibility, while positive for rule-making resilience, carries a cost for stewardship goals. The uncertainty embedded in the outcomes of negotiation processes erode expectations about future positions. The gear allocation process works against adaptation to structural change in the industry or changes in the market. The negotiation process established the importance of historical precedent to the "fairness" of a gear share. Changes in gear composition within the industry or changes in value-added possibilities associated with particular gears are therefore not well accommodated.

Like the license limitation program, the individual quota program is limited in its flexibility to adapt rules of operation to changing conditions. Because program coverage is limited to the fixed gear sector, it is also limited in the extent to which it can adapt to changing industry structure. Trading within the fixed gear sector allows within-gear flexibility, but shifts in technology that would attract quota share out of the fixed gear sector cannot be accommodated under the program. As a tradeable permit system, the program is extremely adaptable to changes in the market for sablefish or permits within the fixed-gear sector.

4.4 Efficiency

Table 4 summarizes the effects of the three processes on three cost elements which affect the efficiency of the management process: costs of information gathering and processing, coordination of decision makers and user groups, and enforcement costs. Since the objective of a management process is to be cost-effective, a plus is assigned for a process that contributes to the lowering of costs. A minus is assigned to processes which contribute to

increases in management costs.

 Table 4 about here

The process used to develop the license limitation program increased costs of information during the development period as data on industry structure and the performance of individual operators was collected. Analysis conducted to estimate impacts of program alternatives on various industry sectors was extremely data-intensive. Industry members realized additional information costs in the development period as they prepared documentation of performance histories. After the initial assignment of permits, the operation of the Permit Review Board required still further information on individual performance. Once the program was implemented, however, information requirements were reduced to pre-program levels. As with information costs, coordination costs of the license limitation program were front-loaded. The active consultation with a large number of people created costs of time and money for industry, agency staff, Council staff, and scientific advisors. Post-implementation coordination costs are limited to the operations of the Permit Review Board. Enforcement costs are expected to remain unchanged²⁴.

The sablefish gear allocation process imposes a relatively neutral effect on the costs of information. Data used in the allocation is relatively readily available, although gear-specific data would not be needed if quota shares to each sector were not specified. The negotiation process increased the costs of coordinating between gear groups by requiring them to meet on a continuing basis. The separate seasons and quotas for the two groups made in-season monitoring of landings relatively easy to track and enforce.

The process used to develop the ITQ program, like the license limitation program, imposed relatively high information costs during the development stage. Unlike the license limitation program, post-implementation data collection costs would have remained high as the cumulative landings of individuals were tracked. Coordination costs were high during the development stage but would be expected to decrease substantially once the quota share market was in operation. Because of the data intensity of the individual tracking process and the need to monitor for bycatching and discards, enforcement costs under the ITQ would be relatively high²⁷.

5 Conclusions

Industry participation in fishery management can make either a positive or negative contribution to the performance of a fishery management process as measured by equity, stewardship, resilience and efficiency.

For the three case studies examined here, industry participation contributed positively

to equity when representation of interests was complete, the management process clear, expectations could be moved toward congruency, and where the resource situation allowed distributions which avoided large-scale losses to any single group. Processes which were clear and had full representation were those that lasted for several years. The creation of homogeneous expectations resulted from the process which included the largest number of interests during its development and incorporated an educational component. Industry participation hindered the achievement of equity when participation was unrepresentative, processes were confused or appeared closed, when common objectives could not be defined and when the effects of any possible distribution were considered unacceptable by at least one group.

Industry participation in management contributed positively to stewardship when time horizons of expected tenure in the fishery were lengthened by the process³³, when participants helped design monitoring programs based on realistic assessments of industry operations, and when enforcement systems were designed to be consistent with fishing operations. Processes which lengthened the time horizon were those which created expectations of assigned rights of access. Processes which designed realistic monitoring and enforcement systems were those which relied on incremental, rather than large-scale, changes in existing monitoring and enforcement systems. Industry participation worked against stewardship when it increased uncertainty about tenure in the fishery, resulted in regulations which could not be effectively monitored, or contributed to enforcement problems.

Industry participation contributed to the resilience of the management process when it resulted in rules which were flexible to changing conditions and led to programs which could adapt to changes in industry structure and market conditions. Processes which contributed most to resilience were those directed toward transferable rights to fish, although with both these programs sensitivity to equity issues led to programs so complex in structure that rule flexibility was hindered. Industry participation worked against process resiliency when representation was "frozen" in a particular distribution reflecting fleet composition or market structure at a particular point in time.

Industry participation contributed to the cost-effectiveness of management processes when it was able to lower costs of information through supplemental knowledge, when the number of participants was small enough to allow efficient coordination, and when the contribution of knowledge on industry operations led to lowered enforcement costs. None of the three processes was uniformly cost-reducing in the program design stage. Two of the processes could be expected to contribute to lowered costs in the implementation stage. The exception was the ITQ development process, which led to a program requiring a new type of enforcement system.

The measures of fishery performance can work against each other. Desires to be fair and avoid unacceptable distributional effects can lead to a degree of rule complexity that hinders resilience. Attempts to promote resilience can work against stewardship if ecological resiliency is not also monitored. Stewardship objectives may work against equity if incentives

to lengthen time horizons conflict with social preferences about fair access. Efficiency objectives can also overwhelm equity concerns.

The effect of industry participation on the fishery performance measures depends not only on the structure and process of participation, but also on resource conditions and on the program under consideration. Participation can contribute positively to fishery management performance when it is representative of all interests, creates a clear process, is appropriately timed, lengthens the expectation of tenure, aims at flexibility, is operationally grounded, and is sensitive to equity issues. To make these positive contributions, participation should be incorporated into the management process before resource conditions decline to the point of serious scarcity. Perhaps the most sobering lesson from the case studies is the way management processes increase in difficulty as resource scarcity increases. Once exploitation pressure increases to the point that management becomes a negative-sum game, industry cooperation for collective goals becomes more difficult to maintain, leading to processes which break down in disharmony and disarray.

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9. REFERENCES

1. Schelling, T.C. 1960. *The Strategy of Conflict*. Oxford University Press, Oxford, 1977 reprint.
2. Runge, C.F. 1984. Institutions and the free rider: the assurance problem in collective action. *Journal of Politics* 46(1): 154-181.
3. Olsen, M. 1965. *The Logic of Collective Action*. Harvard University Press, Cambridge.

4. Rothschild, J. and J.A. Whitt. 1986. *The Cooperative Workplace*. Cambridge University Press, Cambridge, UK.
5. Arrow, K.J. 1974. *The Limits of Organization*. W.W. Norton & Company, Inc., New York.
6. Matthews, R.C.O. 1986. The economics of institutions and the sources of growth. *Economic Journal* 96 (December): 903-910.
7. Hirschman, A.O. 1986. *Rival Views of Market Society and Other Recent Essays*. Viking Penguin, Inc., New York.
8. Anderson, L. 1977. *The Economics of Fisheries Management*. Johns Hopkins University Press, Baltimore, MD.
9. Wilson, J.A. 1982. The economical management of multispecies fisheries. *Land Economics* 58: 417-34.
10. Beddington, J.R. and R.B. Rettig. 1984. Approached to the regulation of fishing effort. *FAO Fishery Technical Paper No. 243*, Food and Agricultural Organization of the United Nations, Rome, Italy.
11. Hannesson, R. 1985. Inefficiency through government regulations: the case of Norway's fishery policy. *Marine Resource Economics* 2: 115-41.
12. Townsend, R.E. 1990. Entry restrictions in the fishery: a survey of the evidence. *Land Economics* 66(4): 359-378.
13. Neher, P.A., R. Arnason, and N. Mollet, eds. 1989. *Rights Based Fishing*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
14. Organization for Economic Co-operation and Development. 1993. *The Use of Individual Quotas in Fisheries Management*. OECD, Paris, France.
15. Ruddle, K. 1993. Local knowledge in the folk management of fisheries and coastal marine environments. In C.L. Dyer and J.R. McGoodwin, eds. *Folk Management in the World's Fisheries*. University of Colorado Press, Boulder, CO.
16. McCay, B.J. 1993. Management regimes. *Beijer International Institute of Ecological Economics Discussion Paper No. xxx*
17. Jentoft, S. 1989. Fisheries co-management: delegating government responsibility to fishermen's organizations. *Marine Policy* 13(2): 137-154.

18. Pinkerton, E., ed. 1989. *Co-operative Management of Local Fisheries: New Directions for Improved Management and Community Development*. University of British Columbia Press, Vancouver.
19. Holling, C.S. 1986. Resilience of ecosystems: local surprise and global change. Pp. 292-317 in E.C. Clark and R.E. Munn, eds. *Sustainable Development of the Biosphere*. Cambridge University Press, Cambridge, UK.
20. Magnuson Fishery Conservation and Management Act. 1977. Public Law 94-265, as amended through november 28, 1990.
21. Pacific Fishery Management Council. 1992. Council operating procedures. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201, July.
22. Pacific Fishery Management Council. 1994. Status of the Pacific coast groundfish fishery through 1994 and recommended acceptable biological catches for 1995. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201, October.
23. Freeman, K. 1988. Is Alaska groundfish overcapitalized? *Pacific Fishing* 9(3): 42-48.
24. Pacific Fishery Management Council. 1992. Amendment 6 (limited entry) to the fishery management plan for Pacific coast groundfish. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201, January.
25. Hastie, J. 1989. An economic analysis of markets for Pacific sablefish. *U.S. Department of Commerce NOAA Tech. Memo. NMFS F/NWC-171*.
26. Glock, J. 1995. Personal communication. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201
27. Pacific Fishery Management Council. 1994. Draft amendment 8 (fixed gear sablefish individual quotas) to the Pacific coast groundfish fishery management plan. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201, January.
28. Pacific Fishery Management Council. 1992. Letter establishing appointment to the Individual Quota Industry Committee. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201, August 3, 1992.
29. Gordon, H.S. 1954. The economic theory of a common property resource: the fishery. *Journal of Political Economy* 62(2):124-142.

30. Seger, J. 1995. Personal communication. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201
31. Pacific Fishery Management Council. 1994. Public testimony on draft amendment 8 (fixed gear sablefish individual quotas) to the Pacific coast groundfish fishery management plan. Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201, July and October 1994.
32. Pacific Fishery Management Council. 1994. *Council News* 18(5). Pacific Fishery Management Council, 2130 SW Fifth Avenue, Suite 224, Portland, OR 97201.
33. Hanna, S.S. and C.L. Smith. 1993. Attitudes of trawl vessel captains about work, resource use and fishery management. *North American Journal of Fishery Management* 13:367-375.

Table 1. Equity effects of three industry participation processes of the Pacific Fishery Management Council.

Equity Element	Management Process		
	LL ¹	GA ²	ITQ ³
1. Representation	+	+	-
2. Process clarity	+	+/-	-
3. Homogeneous expectations	+	-	-
4. Distributive Effects	+/-	-	-

¹ Groundfish license limitation program

² Inter-gear sablefish allocation

³ Fixed-gear sablefish individual transferable quotas

Table 2. Stewardship effects of three industry participation processes of the Pacific Fishery Management Council.

Stewardship Element	Management Process		
	LL ¹	GA ²	ITQ ³
1. Time horizon	+	-	+
2. Monitoring	+	+	-
3. Enforcement	+	+	-

¹ Groundfish license limitation program

² Inter-gear sablefish allocation

³ Fixed-gear sablefish individual transferable quotas

Table 3. Resilience effects of three industry participation processes of the Pacific Fishery Management Council.

Resilience Element	Management Process		
	LL ¹	GA ²	ITQ ³
1. Rule Flexibility	-	+	-
2. Structural Adaptation	+	-	+/-
3. Market adaptation	+	-	+

¹ Groundfish license limitation program

² Inter-gear sablefish allocation

³ Fixed-gear sablefish individual transferable quotas

Table 4. Efficiency effects of three industry participation processes of the Pacific Fishery Management Council.

Cost Element	Management Process		
	LL ¹	GA ²	ITQ ³
1. Information costs	+/-	+/-	-
2. Coordination costs	-	-	+/-
3. Enforcement costs	+	+	-

¹ Groundfish license limitation program

² Inter-gear sablefish allocation

³ Fixed-gear sablefish individual transferable quotas