

cooperation, competition, and synergy: information-sharing groups among Southeast Alaskan salmon seiners

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Taken singly human beings are unimpressive physical specimens—cheetahs run faster, dolphins swim better, bacteria are more efficient, and monkeys are more agile. It is not physical prowess that underlies our species's success but rather our amazing sociability. By forming into groups we overcome our individual limitations to move mountains, divert rivers, and fashion human worlds. Unlike ant or termite societies, however, human sociability is a continuing process of negotiation in which individuals cooperate and/or compete with one another in pursuit of diverse goals. Specifying the conditions under which one modality or the other dominates social relations has been a major theme of theorists from Hobbes and Rousseau to Marx and Durkheim to the present.

At least since Malthus drew attention to the "dismal" plight of humankind, people in the Western world have found cooperation more difficult to explain than competition. The commonsense understanding of cooperation says that individuals will act together whenever they have some common interest. This view has been refined by distinguishing objectively definable social situations from the perceptions of people acting within those situations. Following social psychologist Deutsch (1949:131-132), a cooperative social situation is one in which a person can attain his or her goal if, and only if, others do as well. A competitive social situation is one in which a person's attainment of his or her goal prohibits or diminishes similar attainment by others. A person's behavior is not "cooperative" or "competitive," however, unless he or she so perceives it, and a person's perception of a situation may or may not correspond with its objectively discernible character (Deutsch 1949:137). These definitions underlie considerable experimental research in the social psychology of small groups (see Palazzolo 1981 for one review). The major hypothesis of such a view is that given sufficient experience with an environment or situation—a matter

The salmon seine fishery of Southeast Alaska is a tightly regulated and very competitive commercial enterprise. Despite relations marked by competition, small groups of skippers cooperate with one another to the extent of sharing information as they scout for salmon just in advance of legal seine periods. This paper analyzes these voluntary action groups in terms of the role they play in helping skippers to discharge their most important responsibility: deciding where to fish. The size, timing of activities, and limited purpose of the groups are then explicated with respect to the cultural ecology of the seine fishery. [maritime anthropology, voluntary action, cultural ecology, decision processes]

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of learning—people will behave cooperatively or competitively as predicted by an objective analysis of the environment or situation.

While maintaining the distinction between objective and perceived situations, economists provide a somewhat different view on the issue of participation in common interest groups. Suppose, for example, there is a group of profit-maximizing firms in a perfectly competitive industry. While it is clearly in each firm's interest to maintain high prices by controlling the output level of the industry as a whole, in fact each firm will find it advantageous in the short-run to increase its output to the point where marginal cost equals price. The result of this behavior in the aggregate is that the industry overproduces and the price falls, hurting each firm (Olson 1965:9–10). Applied to groups of individuals rather than to firms, this economic view explains "social loafing"¹ as the thing to do even if the individual is aware of the objective situation and shares the group's goal. Only if certain additional conditions obtain will the individual be motivated to participate fully in the collective action and dispense with his "let-the-other-guy-do-it" attitude.

Commercial fisheries suffer impediments to collective action just as Olson describes for other industries. Fisheries are notoriously competitive, both objectively and subjectively. Following the ground-breaking work of economists Gordon (1954) and Scott (1955), many people feel the root of this problem lies in the common property legal status of aquatic resources. And, in fact, formal cooperative organizations among fishermen have been difficult to establish and to maintain compared with agricultural cooperatives, though the exact reasons are not completely clear (Pollnac and Carmo 1980; Poggie 1980; McGoodwin 1980; Sabella 1980). Yet, despite problems of maintaining formal organizations, fishermen do seem aware of the need to cooperate if they are to achieve some control over their livelihood (Orbach 1980; Petterson 1980).

This paper analyzes a special kind of cooperative behavior in what is otherwise a very competitive situation: the salmon purse seine fishery of Southeast Alaska. Small groups of skippers overcome their general competitiveness to the extent of sharing information as they scout for salmon the day or two before legal seine periods. These information-sharing cliques are very limited in purpose and completely volitional. Not every skipper participates in such a group, but no skipper participates in more than one.

The first section of the paper provides background information on the cultural ecology of the seine fishery. This is the broadest context to which the information-sharing cliques are responses. The second section describes the composition and activities of the cliques themselves. In the third section the focus shifts from general features of the situation to how skippers discharge their primary responsibility—deciding where to fish. Problems in making these decisions are the immediate "objective situation" in which skippers may be motivated to share information with a select few of their competitors. I argue, in agreement with Deutsch's and Olson's models of cooperation, that information sharing does make sense in terms of an objective analysis of the social situation. The benefits of sharing information are not merely "additive" (Rapoport and Horvath 1974); rather, there is a *synergy* (a combined action or operation, the total effect being greater than the sum of the independent efforts) produced from this form of cooperation. Further, individual contributions can be identified by the group, and the benefits of cooperation are equally distributed.

Questions above and beyond the common interest or shared motive of clique participants are addressed in the fourth section. For example, why do not all skippers participate in such groups, why are the cliques active in advance of only some seine periods, and why are the cliques so small? To answer these questions, we must view the activities of skippers within the larger framework of the fishery as a whole. Certain configurations of this larger context may inhibit the formation or the activation of the cliques—the benefits to be derived from cooperation are very much dependent on various states of affairs in the

larger milieu—but without the synergy of cooperation, no skipper would be likely to share information at all.

ecological and social context of salmon seining

The various contextual factors which influence and constrain the practice of seining can be arranged into four broad categories. Some of these may appear tangential, but taken collectively they distinguish the Inside Waters of Southeast Alaska from other, similar fisheries.

geographical factors It rains a lot in Southeast Alaska, up to 3.7 m per year near Ketchikan, and the landscape consists of mountaintops. This combination produces hundreds or thousands of streams, each having its own outlet to the ocean. These simple facts of geography—rugged coastline and many small streams—make the Inside Waters seine fishery subtly different from the Outside Waters fishery of Alaska and from the major river fisheries along the Northwest Coast. While the same boats and crews may seine for salmon in all three regions during a season, only in the Inside Waters do boats line up and wait their turns at “hook offs.”

A hook off is a place along the shoreline where the water becomes deep enough rapidly enough to allow against-the-shore seining without danger of ripping the net on submerged rock outcroppings. Generally, Inside Waters seiners catch their salmon at such hook offs. In contrast, Outside Waters and Puget Sound seiners catch their salmon in open water (not along the shoreline), and thus do not have to wait for turns to set their seines in the water.

biological factors There are several behaviors of the salmon that affect the behavior of their human predators. The three principal species seiners catch—pinks or humpies (*Oncorhynchus gorbuscha*), dogs or chums or keta (*O. keta*), and sockeyes or reds (*O. nerka*)—are wide-ranging, migratory fish that travel in relatively large schools. The seiners catch the fish as they near the end of their life cycles and are returning to spawn. Two implications of this are: (1) purse seining for salmon is seasonal work lasting only two or three months, and (2) it is very important, yet very difficult, to predict where the salmon will be from one day to the next.

The size of the salmon runs has been dwindling for the last 60 or 70 years. This decline has prompted various regulatory policies as well as cutbacks in fish-processing capital investments. Today, seiners use abandoned cannery buildings to work on their seines.

When the salmon reach the Inside Waters, they disperse into smaller schools and travel toward specific spawning streams. During this phase of their migration, the salmon often swim near the coastlines and occasionally jump above the water’s surface. The dispersal in search of spawning streams is what makes hook offs such good places to seine. The fish are trying to locate their streams, and to do this they swim near the shore. Hence, the best place for one’s seine is right against the shore, but there are only a few places where this can be done—maybe one hook off every 0.8 to 3 km.

The salmon jumps are what skippers and crews look for as they scout areas in advance of seine periods. Experienced seiners can tell the species of a salmon from the way the fish jumps, and even novices can tell in which direction the fish was swimming. Sometimes large catches are made in a place where no jumps were seen; but generally speaking, the more jumps the better. The number of jumps is the standard index seiners use to rank scouted areas and is the principal information skippers share within the cliques.

political and economic factors The salmon fisheries of Alaska are tightly regulated industries involving the whole gamut of regulatory techniques, from limited entry licensing and gear restrictions to temporal controls (see Rogers 1960; Gulland 1977:127-154; Penroyer 1979; Martin 1979; Mathisen 1979), determined today by the Alaska Department of Fish and Game (ADF&G). During the season, roughly from July to late September for the Inside Waters, the ADF&G announces "openings." An announcement specifies both when and where legal seining may occur and is publicized from two to five days in advance of the opening itself. Typically, there may be a 36-hour opening in three or four ADF&G administrative areas. From the seiner's viewpoint, these administrative areas break down into 12 or so places to seine, each having several hook offs.

A whole season may have as few as 18 legal seining days (e.g., the 1975 season). Thus, it is important that a boat not miss an opening owing to engine trouble, crew absenteeism, or some other mishap. Also, during the hours of an opening, no one wants to waste time cruising around with the seine on deck or waiting idly in line at a hook off. There is simply too little time to squander the hours hunting for schools of salmon in hopes of making sets on them. In this respect, as well as others, salmon seining is rather different from mid-ocean tuna seining (Orbach 1977) or Atlantic trawling (Zulaika 1981). Further, the tight temporal and geographical regulation of the seine fishery accentuates the natural seasonality of the salmon runs.

Another major external constraint on the seine fishery is that the cold-storage plants and canneries have upper limits on the number of fish they can process per day. During a poor or average year, the fleet does not exceed these processing capacities. But in a good year the catch from the fleet as a whole may exceed the processing limits. Should this occur, the canneries impose quotas. For example, a seine boat will not be allowed to sell more than a quota of 4000 fish per day.² The imposition of quotas has rather direct effects on whether the information-sharing cliques are active or not, as discussed below.

A final pervasive feature of the fishery arising out of the larger economic milieu is that the seine boats are run as small capitalistic businesses. The fish-processing companies keep tally on the numbers of fish and their poundages according to the boat from which they were caught, not which cluster of boats or the fleet collectively. In this way, remuneration is based on one's own catch and is influenced only indirectly by the catches of other boats through price adjustments based on supply and demand. Unlike the New Jersey fishery described by McCay (1981), however, these price adjustments are usually computed before a season begins, with the result that prices do not fluctuate very much during a season. This situation is congruent with the ethos of the seine fishermen. Moreover, there are some very real aspects of ownership that support the current system in which the individual boat is the unit of bookkeeping.

Only a small percentage of skippers own their boats free of any mortgage. Most of the boats in the fleet are company owned, and skippers contract to run them for one season at a time. The high cost of modern seining hardware in conjunction with the dwindling salmon runs makes it difficult for individual skippers to purchase all the necessary capital goods. Yet the fleet is not vertically integrated in day-to-day fishing procedures such as Andersen (1972) reports among Newfoundland deep-sea trawlers. There is no attempt to manage and coordinate the activities of skippers and their boats by company personnel on shore. In fact, companies foster a heightened competition among their skippers by offering incentives based on a skipper's catch rank in the fleet—skippers who do better get better boats in subsequent seasons. These ownership patterns and company policies mitigate against some kind of formal risk sharing among seiners similar to those noted among many peasant societies (Foster 1965), because each skipper either is in debt and has to pay his creditors or

he is trying to improve his relative standing vis-à-vis other skippers. In connection with this, it is interesting to note that there is no fisherman's union in Alaska, despite the prevalence and strength of unions in almost all other sectors of work. The closest thing to a union is a rather weak Seiner's Association, but not all skippers belong to this organization and very few crew members do. As a result, seiners are generally at the mercy of the large fish-processing companies and do little to combat the price structure for their produce.

The human response to these factors is to see seining as gambling, a chance to make lots of money in a relatively short time. This conception of the work finds support in the natural seasonality of the salmon runs accentuated by the ADF&G regulatory policies, by ownership patterns in regard to basic capital goods, by the desires of the fishermen themselves, and by the fact that seining is seldom the only occupation of the fishermen in the course of a year. For more information concerning the economic system of Southeast Alaska and the history of purse seining there, see Rogers (1960), Melteff (1979), and relevant sections of Browning (1974), Langdon (1977, 1980), Gatewood (1978), and Meltzer (1980).

traditional seining institutions Alaska salmon seine boats are about 17 m long and have crews of from five to eight people, the skipper included. Like many other fisheries, seining is rewarded on a "share" system. Labor, management, and capital all receive fixed percentages of the total value of a boat's catch. Typically, there are 11 or so shares per boat. Each crew member receives 1 share, the skipper receives from 1.5 to 2 shares, and the remaining shares are divided among the owner(s) of the boat, seine, power skiff, and other major items of equipment.

The skipper may or may not own the boat and its equipment; nonetheless, he is the boss. Crew members are hired and fired by the skipper, and they require his signature to receive their checks from the cannery's accounting office. The duties of the skipper include organizing the division of labor on his boat, acting as the repository of seining lore, being the principal liaison with other boats and the fish-processing companies, and deciding where the boat will seine during openings. Given that the boat is rather small and the crew size not overwhelming, a skipper cannot retreat to his bridge and direct the work from that distance or through intermediaries. He is not a distant executive; quite the contrary, he is a working member of the team on deck. Of course, a skipper's personality is crucial here, and there are different styles of being skipper.

Some skippers prefer to play their role in an authoritarian manner, similar to what Bailey (1969) terms a "strong" leader. They issue commands and expect instant and unquestioning compliance. They do not converse easily and informally while fishing, and they do not share matters of concern with their crews. Other skippers perform their role in a very democratic fashion, what Bailey calls a "weak" leadership style. They are less a superior and more a first among equals. They often ask experienced crew members their opinions on fishing issues and, generally, display a more relaxed and open interpersonal manner. In both polar types and the full range in between, however, skippers take their position seriously and know that the final responsibility for the boat's management rests on them.

Crew members, for their part, are supposed to be always ready and eager to seine. During an opening, the day begins about 4:30 A.M. to the tune of the boat's diesel engine and ends around midnight, after the day's catch has been unloaded to a fish-processing company's tender boat. The days seining are physically demanding and psychologically intense (see Langdon 1977 and Gatewood 1978 for descriptions of typical fishing days). In stark contrast, once back in port and after cleaning the boat and repairing the seine, crew members do no work whatsoever until the day or two before the next opening. During this interlude, seiners play about as hard as they have been working.

Apart from the clear lines of authority when actually fishing, the social life on a seine

boat is governed by informal mutual expectations and subtle means of communicating sentiments. The physical closeness of crews and skippers heightens and intensifies the nuances of social behavior. And, given the share system, skippers are even more attuned to the feelings and judgments of their crews. For example, if crews were paid on a wage or salary basis, then skippers could fairly ignore them so long as enough fish were caught to meet the payroll. As it is, skippers are very concerned, outwardly or inwardly, with crew responses and attitudes.

Assuming the skipper is no longer a novice, he can probably manage all things pertinent to organizing the crew's work, handling foul-ups when they occur, and dealing with other boats. The most demanding aspect of his job, and the most important for his success, is deciding where to seine during the openings. No crew member wants to think his skipper just randomly selects seining locations. Neither would he want to work for a skipper who merely follows other boats. A good skipper is supposed to use his accumulated knowledge of salmon behavior and other factors to make rational decisions. These may prove poor in hindsight, but errors of judgment will be tolerated, for a while, provided they are interpreted as reasonable mistakes and not stupidly made, irresponsible, thoughtless blunders. In this respect, Alaskan seiners are similar to Norwegian herring seinermen (Barth 1966) but unlike Icelandic fishermen, who explain their choices of fishing locations as coming to them in dreams (Pálsson and Durrenberger 1982). Alaskan skippers, authoritarian and democratic alike, project at least an *image* of rationality at all times (Gatewood 1983).

composition and function of information-sharing cliques

Skippers of the 350 to 400 seine boats operating in Southeast Alaska are quite competitive with one another in most work contexts. Large catches bring "bragging rights" as well as financial rewards. Despite relations marked by competition, small groups of skippers negotiate a limited form of cooperation in advance of some seine periods to share scouting reports on the numbers of fish and other boats seen in the various areas.

These information-sharing cliques are interesting because they are the maximal form of cooperation evident in the seining fleet. There are other ways boats cooperate. For example, if a boat has mechanical difficulties while seining, a friendly boat fishing nearby may well give assistance in the guise of spare parts or a short tow. Or, if a boat has ripped a large hole in its seine, friends of the skipper and crew may help with the repair work once back in port. In the case of sharing scouting information, however, the benefits of cooperation are immediate and symmetrical with each exchange.³ Furthermore, unlike cases of assistance in times of dire need, sharing information is an optimistic strategy whereby the participants are supposed to catch more fish rather than merely hold their own. Clique membership is the most exclusive of the cooperative relations evident in the fleet; it entails the other forms, but not conversely.

Cliques range in size from two to five cooperating skippers. By far, most of the cliques are based on close kinship relations: father-son, brother-brother, uncle-nephew, or some combination of these. Some, however, form on the basis of more distant kinship relations or life-long friendships. I know of no case where clique members had no previous relationships among themselves. This kind of familial recruitment to cliques makes sense given that information sharing requires considerable trust among the participants that they will (1) provide honest and full information within the clique, and (2) not leak information to outsiders.

It would be a mistake, however, to think that cooperation within a clique is merely a carry-over of qualities inherent in the kinship or friendship relations or that there is no com-

petition within the bounds of a clique. Clique members do not socialize during the off-season, nor do they assist one another in other contexts more than they would with anyone else. In this respect, Alaskan seine skippers are similar to the Atlantic gillnet fishermen described by Nemeč (1972). Further, the most intense competition, at least for prestige, often seems to occur precisely among skippers and crews in a clique—differences of even five fish for an opening may be grounds for gloating and various snide remarks. The important point is that in cooperating with kin or long-term friends, the underlying relationships are enduring and diffuse. Failure to live up to clique expectations regarding honesty, secrecy with outsiders, and so on, would jeopardize these previous and more general social relationships. Hence, the kinship or friendship constitutes a form of “social collateral” against which clique members feel secure in trusting one another.

The manifest function of the cliques is to share scouting reports and thereby reduce the travel time and costs of each participating boat while obtaining reliable information on open areas. Usually two days before an opening begins, the participating skippers get together on one of their boats and talk about where they think the best places to fish will be. Then they divide the open territories and agree to rendezvous at some chosen spot at a particular time. They do this negotiating face-to-face to keep skippers who are not in the clique from knowing the specific arrangements being made. The boats then leave port, heading in various directions, and proceed to scout their assigned areas.

The afternoon before the opening begins—openings almost invariably commence at 6:00 A.M.—the boats meet at their rendezvous spot and talk over what each has seen. Occasionally, participants use their radios to exchange information of this sort, but generally this is not done because radio communications must be prefaced with call numbers and non-clique members may recognize these or the voice of the caller. As a result, the information exchange takes place in the full view and hearing of the crews, and there is usually some teasing and joking as accompaniment.

When the rendezvous is over, each skipper decides for himself where his boat will actually go to seine. A variety of considerations enter into this decision (as explained in the following section); hence, nonconformity is not regarded as evidence of subversion or deception. The boats part company, perhaps to scout additional areas on their own or to travel directly to their chosen seining locations, and the temporary cooperative pact is at an end until its next activation.

In addition to this manifest function, there are two auxiliary functions that bear mentioning, though it is not clear whether skippers are themselves conscious of these. The first pertains only to those skippers who perform their role in the democratic style mentioned earlier. Such a skipper accomplishes two things: (1) he spreads some of the responsibility for a poor decision onto the very people who are otherwise entitled to hold him solely responsible, and (2) he postures as a “nice guy.” On the negative side, this kind of skipper risks habituating his crew into thinking that they have a right to disagree and argue with him. For this reason a skipper should be thoroughly competent in seining lore and skilled at the actual deck work before trying this performance. Competence in other aspects of his role will keep his crew respectful, and they will not come to resent his democratic, open style. For this kind of skipper, participation in a clique creates situations in which his crew can see other skippers having difficulty deciding where to fish. This social confirmation of his problems may add credibility to his own behavior, and his reputation as a “nice guy” (rather than an “incompetent jerk”) is thereby enhanced.

The second latent function of participation in a clique is that the rendezvous meetings provide opportune public forums for the display of a skipper’s “rational” approach to his crew. If a skipper has participated in a clique, then even if the catch is poor the crew will be more inclined to give their skipper credit for at least trying to do well. They have witnessed

him deliberating his charge and know that the final decision was grounded on his interpretation of important facts. This second indirect benefit of clique participation accrues to both democratic and authoritarian skippers. In fact, with authoritarian types these overheard conversations are about the only means crews have of fathoming their skippers' thought processes.

To summarize, the information-sharing cliques are very small, exclusive, temporary groups whose membership is based on close kinship or friendship ties. Contributions to the collective activity are individually monitored (though their validity is taken on trust rather than independently checked), and the benefits of cooperation are equally distributed in the sense that each participant hears what all the others provide. Thus, the cliques fulfill Olson's (1965:22-36) conditions under which cooperative ventures should achieve full and equal voluntary participation; indeed, this is the case. The time of activity as groups is the day or two immediately preceding openings, and though membership is stable, the group interactions are renegotiated each time. Participation in a clique has latent functions in the realm of impression management, but the primary and manifest function is to help the participating skippers make wise decisions as to where to fish while reducing travel time and related costs. This decision process and its attendant problems are central to a fuller understanding of the cliques for they constitute the social situation in which the cliques form.

deciding where to fish and deciding to share information

As others have noted (e.g., Davenport 1960), fishing is gamelike in several respects. There are definite objectives, and there are procedures for achieving those objectives. In addition to environmental or background conditions, which are passive, at least in the short-run, with respect to human activity, there are other players whose behavior may influence one's own outcomes. Fishing is unlike pure games in that the players do not have perfect knowledge of the rules and of the outcomes for each choice, nor are they thoroughly rational in the sense of having algorithmic procedures for coming to specific decisions from finite amounts of information (Rapoport 1959 notes these are shortcomings of game theory to many real-life situations). The "game" of seining takes place in an imperfectly understood ecological setting the specific character of which influences the outcomes of the choices that are made. Nonetheless, the analogy does illuminate much of what confronts skippers as they struggle to gauge complex situations and decide where to fish while maintaining an image of rationality.

This section presents seining in its gamelike guise to highlight the difficulties skippers routinely face as they wrest a living from the sea. As is shown, these difficulties constitute the immediate motivation for skippers to cooperate in the information-sharing cliques.

the rewards and objectives of seining There are three kinds of rewards in seining. First, and most obvious, is the money to be made. This is the explicit reason for the work. Second is prestige. As Shimkin and Lowe (1978) observe, prestige is often omitted from analyses of competitive behavior, and to do so is a serious oversight. And third, seining is fun. Smith (1981) shows how this third element is relevant in formulating regulatory policies, but here I am concerned with only the first and second rewards of seining.

For the most part, the prestige and financial gaming happen simultaneously and are tightly interrelated. As a rule, prestige accrues in direct proportion to the size of a boat's catch relative to the catches of other boats. Thus, prestige and money are won through the same means: catching a lot of salmon. There are two formal differences between these

aspects of seining. First, the prestige component is perceived as an n-player zero-sum game, whereas money is perceived as the prize in an n-player non-zero-sum game. I emphasize that this is the perception of the fishermen and not in line with most economic analyses of fishing. Fishermen are becoming more aware that the fishery as a whole exploits an extinguishable resource and is thus a zero-sum situation. But rising prices for what fish there are tend to offset this more holistic perspective on the fishery, and within the confines of a single season it is not at all clear that the fish others catch damage one's own earnings. Second, the demand for prestige is seemingly insatiable, whereas the demand for money derived from seining tends to slacken as more and more is obtained. To gain prestige as a seiner, there is no alternative but to seine well. Money, by contrast, can be and is obtained through a variety of means outside of the fishery. Being rich does not distinguish a person as a fisherman. Seiners as seiners can be "rich enough" but never "good enough."

During normal conditions—when there are no imposed quotas on a boat's catch—seiners have three related means of achieving their rewards of money and prestige: (1) catch many salmon while other boats do not; (2) catch more salmon than do other boats; and (3) catch as many salmon as possible. The first and second means are impractical, short of sabotage, because they involve a boat's catch relative to those of other boats. By default, then, in normal conditions the third means is the concrete and explicit objective of each skipper and crew. It is the only way they can hope to achieve their desired ends through skill, planning, and work.

Should all boats do too well, however, the financial gaming comes to an end because the ensuing quotas, which come into effect during the subsequent opening, place definite upper limits on monetary success. With quotas, the concrete objective of seiners becomes, quite simply, catching the limit. Despite this curtailment in the financial gaming, the prestige component continues as before, with two modifications. Instead of correlating with relative catch size, prestige is now gained by catching the fixed limit in the least time. Also, quotas engender a psychological transformation with respect to prestige issues: quotas increase the risk of losing prestige without a balancing opportunity to gain prestige. Whereas catching the limit is not especially noteworthy, failure to do so is a definite loss of face, an embarrassing circumstance. Of course, a skipper's reputation does not depend on a single opening. Just as backgammon championships are neither won nor lost on the outcome of a single game, skippers build reputations on the basis of whole seasons and even longer series.

From the skipper's point of view, prestige and financial rewards are mutually reinforcing in the long-run. Prestige (the public recognition of success) attracts the more skilled crew members. This, in turn, allows the skipper a wider range of options when deciding where to fish because the better crew is able to work in a wider range of tidal and weather conditions. Also, better crews are faster at retrieving the gear and, other things being equal, can put the seine in the water more often. These increased capabilities are likely to improve a boat's seasonal catch relative to other boats and to further enhance the skipper's prestige. Barth (1966) indicates this sort of positive feedback is present among Norwegian skippers and crews. In Alaska, perennially successful boats are called "highliners."

From the crew member's point of view, prestige is valuable primarily for the enhancement it brings to his social identity in diverse social situations. Prestige, unlike money, is a diffuse asset to one's person. Money buys the groceries, the new car, the extravagant night on the town; but prestige in a locally respected tradition makes all of these occasions sweeter and persists when the money is gone.

Although not a frequently studied or voiced concern, prestige is an important part of seining as a way of life. It is clearly not the major reward—seining is, after all, commercial fishing—but pride and social recognition of skill and success are powerful motivating

forces. In this respect, seining resembles professional sports: the money is very important, but there is more to doing well than being paid well. Because the competition for prestige never lets up, because of its long-term significance to financial rewards (skipper's perspective), and because the crew wants to do well for reasons of self-respect as well as money, the prestige component of seining maintains pressure on skippers to make wise deployment decisions, in good years and bad, with or without cannery quotas.

the skipper's decision process Success or failure in seining comes down to where and when the seine is in the water. Deciding these matters involves a delicate orchestration of efforts: fact finding, interpreting available information, and the final choice. Table 1 offers a list of the most common considerations skippers talk about with other skippers, their crews, and cannery personnel during the days before an announced opening. The first group includes matters a skipper can determine better as his skill improves; the second contains relevant, publicly available information; and the third lists concerns specific to each boat's hardware and crew.

To illustrate in an approximate way how skippers go about making their deployment decisions, I collapse the ethnographic concerns listed in Table 1 into five basic variables. The ensuing model is too simple to accurately reflect cognitive processes in detail, but it does simulate some of what real skippers do when making their decisions. These five analytical variables are:

1. *Hook offs*: the number of hook offs the skipper knows in each area and how well he can fish them.
2. *Crew*: the skipper's estimation of his crew's and equipment's ability to seine in each area given the expected weather and tides and his crew's willingness to work.
3. *Travel time*: how long (at approximately ten knots per hour) and how much it would cost to cruise to each open area, and how long it would take to get to another if the first choice turns out to be a mistake.
4. *Other boats*: the skipper's estimation of which areas will have the fewest other boats, that is, which areas will have the least crowding at their hook offs.
5. *Salmon*: the skipper's estimation of which areas will have the most salmon during the time of the opening.

These five variables are pertinent modes of ranking the areas opened to seining by the

Table 1. Sorts of things skippers think and talk about prior to deciding where to fish.

Skipper's knowledge

time in the salmon runs
navigational dangers in each seining area
number of good hook offs in each area
migration patterns of salmon (at a microlevel)
estimation of where the salmon will be in greatest numbers

Public information

weather forecast for each area
tidal conditions during the opening
how far (travel time) from one open area to another
where big catches have been made so far in the season
ratio of pink to chum salmon caught last opening

Boat and crew particulars

mechanical condition of the boat's major equipment
navigational equipment on the boat (charts, sonar, radar)
skill and attitude of the crew, especially their speed at retrieving gear and their willingness to work in tough conditions

ADF&G. Using these, a hypothetical but very "rational" skipper (Skip) might calculate where to seine in the following way.

Upon receiving the ADF&G announcement, Skip would reclassify the available seining locations into spatial units according to his notions of seining areas. These spatial units would be represented as rows in a matrix, and the five analytical variables would be the columns. To fill in the matrix, Skip expresses his evaluations of the areas in the form of numbers, even though the variables are only ordinal scale. For example, beginning with *hook offs*, he would assign the number "1" to the area in which he knows the most hook offs. In case there is another area about equally good, he also may assign it (them) a valuation of 1; the next best area(s) would be assigned a valuation of 2, and so on. Essentially, Skip is forming, or attempting to form, intervally ranked equivalence classes. Figure 1 illustrates a completed matrix in which the valuations, like Skip, are completely hypothetical.

The matrix preserves the integrity of each variable in the decision, but the act of deciding must sum up or in some other way synthesize the diverse concerns and arrive at a conclusion. At this juncture, the flaws of the crude model become apparent. Addition across the columns is undefined: it would be adding apples and oranges, so to speak. Multiplication, the usual solution to such arithmetic dilemmas, is also illogical because there is no guarantee that the difference between a 2 and a 3 in the *hook offs* column, for example, is of the same magnitude as that between a 2 and a 3 or a 3 and a 4 in the *crew* column. That is, even if within each variable the equivalence classes are ranked by intervals, each variable may have a different absolute scale.

There is a solution to this problem, but it requires using the matrix entries as inputs to another series of computations before summarizing.⁴ Further, requiring Skip to summarize with an illogical, undefined operation simulates, crudely, a felt dilemma of real skippers in that they, too, have problems when it comes time to condense their diverse initial con-

	Hook Offs	Crew	Travel Time	Other Boats	Salmon	Operation I (addition)	Operation II (multiplication)
A	1	2	1	2	2	8*	8**
B	3	2	1	1	3	10	18
C	4	2	3	3	3	15	216
D	2	1	1	4	1	9	8**
E	1	3	2	1	4	11	24
F	3	1	4	2	2	12	48

* Where To Seine (operation I) = Minimum Row Sum

** Where To Seine (operation II) = Minimum Row Product

Figure 1. A crude model of how skippers decide where to fish.

siderations into a final selection (Gatewood 1983). Since skippers in the real world are required to decide something, despite their uneasiness at doing so, Skip must overcome his mathematical qualms and calculate both row sums (Operation I) and row products (Operation II). His piqued mathematical conscience simulates the consternation of real skippers.

In the illustration (Figure 1), area A is the best place for Skip to seine according to row sums on his initial rankings, and areas A and D are equally good according to row products. Both procedures assume that each variable is as important as the others. Should Skip feel that *salmon* is more important than *travel time*, for example, he could modify the model by letting the coefficient of each variable reflect its relative weight.

Returning to real skippers and their problems, they find it relatively easy to evaluate open areas in terms of *hook offs*, *crew*, and *travel time*. One may differ from another in his rankings, but each skipper can determine these matters with confidence—despite the diversity of opinions, these are matters of near certainty. Evaluations in terms of *other boats* and *salmon*, however, involve the skipper's total accumulated understanding of the seine fishery as he tries to predict unknown conditions with imperfect knowledge.

Accurate estimations of where other boats will be is important because overcrowding at hook offs results in wasted seining time as the boats must wait their turns to make sets. Two or three boats can work a hook off without impeding each other; this is the optimum number. While one boat holds its seine open in the water to catch fish, the others are in various stages of retrieving their gear and hauling in their catches. It takes about 30 to 40 minutes to retrieve the seine once the set has been closed to entrap the fish. By informal rules,⁵ seiners should not keep their seines open longer than about 20 to 30 minutes if other boats are waiting. Thus, two or three boats can work a hook off and be busy continuously. However, each boat beyond this optimum must wait 20 to 30 minutes for its turn. For these reasons, peculiar to the Inside Waters seine fishery, *where* other boats have decided to fish affects the catch of each. A good prediction of where the salmon will be can be negated if on arriving at the chosen spot 14 other boats are already in line.⁶

There is no fixed procedure for estimating where other boats will decide to seine. As a result, skippers engage in almost amusing antics as they try to pry this information from poker-faced peers. As soon as an opening is announced, the skippers begin a series of regular encounters. The interrogations may take place at a cannery office, where skippers often congregate to find out where the big catches were made the previous opening. They may happen in one of the many bars, at a laundromat, at the ADF&G office, or perhaps most frequently on the docks or in the galleys of the boats. The deception and obliqueness of the probings among nonclique members are remarkable. Some skippers hold court to a daily procession of visitors, and gallons of coffee are consumed under the half-truth of "I just dropped by to chat and see how things are going." These encounters are among friends, even if competitive friends, and are part of the symbolic affirmation of long-standing interpersonal ties, especially when the interaction takes place on a boat. For these reasons, no one takes offense at receiving false information, though out-and-out lying would be frowned upon.

Despite the difficulty, shrewd skippers often are able to predict where other boats will be. In addition to talking with other skippers, they try to think in the ways they presume a mediocre skipper would and guess that most of the fleet will go to those locations. The single most important variable to calculate is where the salmon will be, and really good skippers can do this in several ways, each being more or less reasonable than the others. Based on close observation and eavesdropping, I discerned about five ways of deciding where the fish will be.

The first method requires the least skill. After each opening, a skipper finds out where

the big catches were made, then he simply goes there the next opening. Although occasionally lucky, this is generally a very poor strategy. Only mediocre skippers—novices, those who cannot think for themselves, and those who are no longer aggressive in seining—act in accordance with this method. Such skippers may also use the second method, which involves a skipper's imperfect knowledge of the "normal" migration routes of salmon (their laws of motion, so to speak) in conjunction with the consensus opinion concerning the stage of the salmon runs. This would make sense if the salmon laws of motion were perfectly known and if every year the salmon runs developed in a uniform manner. Neither of these suppositions is true.

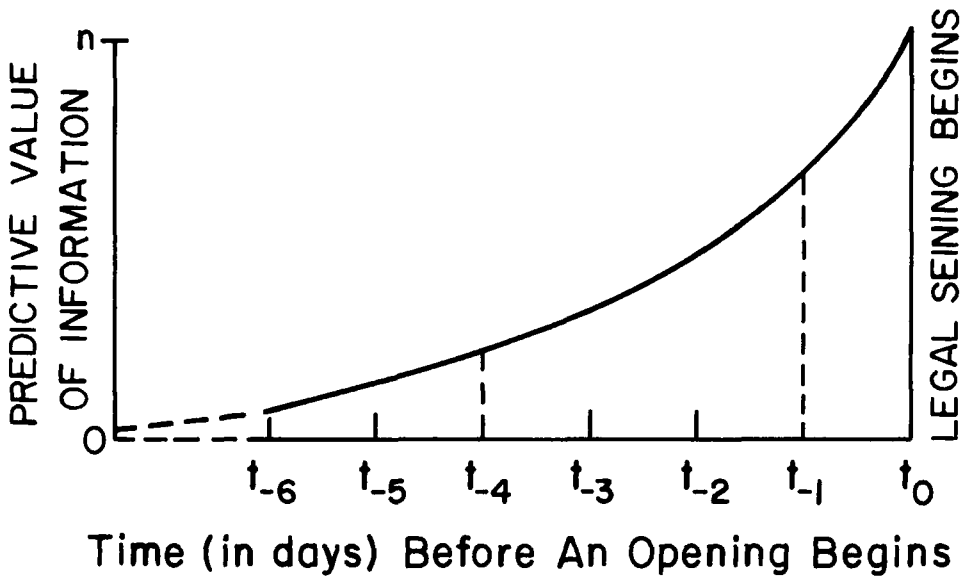
The third, fourth, and fifth methods are very similar to one another in their basic logic. Each exploits a skipper's acquired understandings of the salmon migratory behavior, but unlike the second method, these use seasonally specific information on the whereabouts of salmon. The differences among the third, fourth, and fifth methods are in the quality of this information (the initial-state data). The third method uses the previous opening's results as its data and thus has to predict a week or so of salmon movements. The fourth method uses more recently obtained data—information obtained from scouting open areas the day or two before an opening. And, the fifth method involves cruising around during the opening and making sets when jumps are seen. In this case, the salmon laws of motion become irrelevant because the initial-state data are only trivially distinct from the prediction made from them.

In practice, all skippers, with the exception of those so unimaginative or lazy as to use the first method, leave port a day or two before the beginning of openings to scout areas for salmon jumps. This information helps them to better determine their *salmon* rankings as well as to check where other boats are. This is the immediate context in which the information-sharing cliques are active—cooperating in a clique assists skippers to reach their evaluations of the areas open to seining and, from this, to decide where to fish. What remains to be shown is how cooperation in this undertaking produces benefits unavailable to skippers acting independently—that is, how the objective situation makes cooperation advantageous to participants in cliques.

the synergistic benefits of clique participation As described earlier, the Inside Waters fishery presents special problems to human predators. The ecology of salmon species is very complex, and this complexity is magnified by the intricate geographical distribution of spawning streams. Hence, the migratory patterns of salmon, their laws of motion, are only imperfectly known by fishermen and biologists alike. It follows that the value of information on salmon whereabouts is not time-invariant. Quite the contrary, the value of such information for predicting future salmon locations is very much a function of how far into the future one must be able to predict. The closer to the beginning of an opening one can obtain information, the better that information is. This creates the situation in which information sharing is a wise strategic maneuver in the otherwise competitive business of seining.

While it is true that one boat can scout as wide an area in four days as four boats can in one day, the utility of the information collected by the four boats scouting the day before an opening is much greater, provided they share what each has observed. In such a situation, cooperation produces benefits greater than the simple sum of independent efforts: it is *synergistic*. Sharing information enables participating skippers to obtain better information than they could by scouting all the open areas themselves. Figure 2 illustrates how this works.

The argument for a synergistic effect in sharing information has been phrased in terms of the single issue of salmon and their movements. A similar argument could be constructed



- Case 1: One boat scouts for salmon for four days preceding an opening. It covers a geographic range, G_1 , accruing useful information, I_1 (the area under the curve between t_{-4} and t_0).
- Case 2: Four boats scout for salmon one day preceding an opening. They cover a geographic range, G_2 , accruing useful information, I_2 (four times the area under the curve between t_{-1} and t_0).
- $G_1 = G_2$, but $I_1 < I_2$
- ∴ If four boats share their scouting information (case 2), then their predictive capabilities are much better than if each had acted independently (case 1).

Figure 2. How sharing information produces synergistic effects.

for the issue of where other boats will be. In fact, this latter situation embodies more features of game theory than does the matter of salmon movements. Where other skippers have decided to fish influences the payoffs of one's own decision, but the location of salmon schools is not affected by what skippers do, except in the trivial sense of being caught or not. Phrased another way, salmon are the payoffs, whereas skippers are the players. Generally, the synergistic hypothesis can be stated as follows: Information sharing is synergistic whenever the information is used as initial-state data for laws of motion that predict future states of the system with conditional probabilities rather than with deterministic relations.

This objective analysis of the situation in which information-sharing cliques form shows that there are real benefits to be derived from cooperation that could not be obtained by acting independently. Beyond the fact that cooperation produces better information, there is the additional bonus that such cooperation reduces each boat's travel time and related costs. Cliques are thus temporary coalitions in the n-player zero-sum game for prestige and the n-player non-zero-sum game for money. Congruent with Deutsch's (1949) model of cooperative behavior, there is an objective basis to the overtly "cooperative" behavior of the skippers who participate in information-sharing cliques.

Given that, other things being equal, participation in a clique is likely to improve one's catch by providing better information on which to make the all-important deployment decisions, why is it that not all skippers participate in such arrangements? If information

sharing is advantageous on a small scale, why are not the groups larger in order to reap even greater benefits? Questions such as these ask what conditions inhibit clique formation and activation; that is, what features of the fishery suppress or countermand the motivation to cooperate? To answer them, we must again view the activities of information-sharing cliques in their larger, ecological context.

questions and answers: beyond common interest

why is it that not all skippers participate in cliques? One of the very best skippers in the fleet does not join in the kind of voluntary action group described above, and this is true of several rather poor skippers as well. Conversely, some very good skippers as well as some very inept ones do join such groups. Although there may be some weak correlation between rank order of skippers (measured in terms of their catches for a season) and participation in cliques, such a tabulation only obscures what is happening. There are three very different reasons why some skippers may decide against joining a cooperative clique.

First, some skippers do not know others well enough to establish the trust necessary to make cliques work. As mentioned previously, clique members are usually close kin or life-long friends. Thus, for some skippers, especially novices who have only recently bought into seining, it does not matter whether they recognize or want the potential benefits of information sharing because their social networks are inadequate to the task.

Second, a skipper may recognize the potential benefits of cooperating with others but may find that such interactions undermine the image he wants to project to his crew—that he can handle everything connected with seining by himself. For example, an extremely authoritarian skipper may think his image as a “strong leader” would be eroded were he to openly discuss where to fish with other skippers in front of his crew. For the most part, this kind of reaction is purely idiosyncratic and a matter of priorities in one’s self-image.

Third, some skippers have access to alternatives that provide roughly the same, and in some instances better, information than would be obtained through participation in a clique. One such alternative is the ADF&G, provided the skipper does not harbor a deep-seated resentment of this regulatory agency (Gatewood 1979). Another good source of information is available to skippers who are friendly with several salmon trollers. Trolling for salmon is not regulated by legal trolling times, and trollers cruise around all day almost every day. Since trollers tend to make their living on the species not exploited so much by seiners (i.e., king and coho salmon), and since they are scouting perpetually, a seine skipper who can tap into their grapevine can obtain excellent information without having to share it with his seining competitors. Yet a third, and rather innovative, alternative is to rent a seaplane the day before an opening and scout all the areas from the air. This is not quite as good as scouting from the surface, but some skippers prefer this technique to becoming involved with a small group of others.

why are the cliques so small? This is a difficult question with three reasonable answers, each of which may be partially correct. First, the small size of the cliques may be a side effect, a concomitant of the special purpose of the groups. Experimental studies have shown rather convincingly that groups of different sizes also have different kinds of social interaction patterns, communication patterns, leadership styles, participation levels, and so on (Shaw 1976:154–192). In the case of the information-sharing cliques, trust is perhaps the single most important element in the group, and it seems reasonable to suppose that the fewer people who have to be trusted the better. In connection with this hypothesis, Killworth and Bernard (1974) demonstrate that in a female prison population of 41 inmates and 12 staff, the population as a whole was arranged into smaller groups of 7,

plus or minus 2, “primary communicants.” It would be interesting to pursue this line of hypothesizing—asking what the optimal group size is for various combinations of purposes—but no single case study can hope to resolve such questions.

Second, the size of the cliques may reflect the minimum number of boats necessary to scout all the areas within the time optimum of one day before openings begin. Given the usual territory open to seining at any one time, and given that the boats cruise at a speed of about ten knots per hour, a small number of boats can effectively scout all legal areas, meet at their rendezvous spot, and still get to their preferred locations before the opening begins.

Third, the small size of the cliques may directly reflect the optimal number of boats that can work at a single hook off without creating delays for each other. This reasoning may not seem to fit the facts because it is unclear why more than two, or maximally three, boats would cooperate in a group. However, there is usually no consensus within a clique on final choice of seining location. The skippers share only their scouting information. Each tells his group how many jumps and other boats he has seen in his areas and, after the discussion, where he plans to seine. But each skipper makes his own decision. The scouting information supplies only part of the basis from which the final selections are made. Differences in boat hardware, crew abilities, and interpretation of the scouting news may easily produce intraclique diversity.

This third explanation, though logically no more compelling than the other two, has a certain elegance because both the basic motivation for forming cliques and their size limitations arise in the same process: skippers deciding where to fish. More specifically, it highlights the interplay and trade-off between *salmon* and *other boats* when selecting a good place to seine. To the extent that sharing information does foster a greater consensus in estimates of where the salmon and other boats will be, then too large a clique could result in overcrowding otherwise ideal locations. In this view, it is possible to have too much of a good thing.

why are the cliques active in advance of only some openings and not others? Skippers negotiate to share information only in advance of openings under normal conditions, when there are no quotas and when success has no contrived upper limit. To understand why cliques are not also active in advance of openings with quotas, one must realize that quotas alter the whole psychology of seining.

As long as normal conditions prevail, the sharing of scouting information is strategic and is the behavioral expression of an optimism in which it is appropriate to try every available maximizing effort. With quotas, however, the presumption is that fish are so plentiful that each skipper should be able to catch the limit through his own devices. The shift of focus from money to prestige, which quotas effect, creates conditions under which it is more difficult to negotiate a cooperative effort. Efforts to activate the coalitions in these contexts would be seen as shameless admissions of incompetence because there is no obvious way that sharing information would be mutually beneficial in the altered prestige gaming. Thus, skippers show their disdain for the quotas by acting in carelessly confident ways. No self-respecting skipper would acknowledge that he needs help from others just to catch the quota, which is how others would interpret his actions were he to urge his clique to activity as if normal conditions prevailed. Consequently, the cliques are active only in advance of normal openings. Then, the pride that inhibits formation of coalitions can be submerged without penalty in favor of any reasonable effort to catch more fish.

why are the cliques so limited in purpose? The function of the cliques is to share scouting information. This is their overt purpose, and it is all that marks them as distinct groups. One might wonder why these little groups do not begin to show more extensive

forms of cooperation. For example, a clique of boats could begin catch averaging and improve the security level of each boat, but this does not occur. Sharing information is the *maximal* form of interboat cooperation; the question is why.

Basically, the cliques are very specialized abridgments of the fundamental independence of each boat and skipper. There are some vague feelings of occupational solidarity, such as those Miller and Johnson (1981) report among the salmon gillnetters of Bristol Bay. For example, bar fights sometimes evolve into minor brawls between fishermen and loggers, an old and spirited cleavage plane in Southeast Alaskan social life. But cooperation among fishermen seems to occur only when it is mutually beneficial, not for its own sake. Skippers cooperate in limited ways—to share information, to assist in times of dire need. This is true in one case where two brothers jointly own a boat and equally divide its shares of capital. One brother acts as skipper of the boat and the other is skipper on a company boat. Despite their obvious mutual concerns, they are amazingly competitive with one another and their crews are even more so, though all in a very friendly way. Cliques are minor and bounded lapses in relations marked by competition.

Competition originates in the larger structure of the fishery: in the common-property nature of aquatic resources, in the ownership and remuneration patterns imposed by the fish-processing companies, in the short seasonality of the salmon runs accentuated by the regulatory policies of the ADF&G. Any degree of cooperation must overcome this formidable inertia. In this broader context, seining comes to be viewed as gambling, and gambling is not a team sport. Sharing information has benefits sufficient to justify cooperation, but it does not interfere nor conflict with the fundamental nature of the fishery. Instead, it works within the rules of the game. The larger objective situation of the fishery is competitive. Only if fundamental economic and political structures are changed, or the fishery as a whole is threatened by severe and precipitous declines, will seiners be likely to cooperate in more organized and enduring fashions.⁷

conclusions

The understanding of small voluntary action groups provided in this case study stems from a blend of three perspectives on human behavior: (1) an ecological perspective emphasizing the interplay of numerous mutually constraining variables among the human and nonhuman, living and inanimate aspects of an environment; (2) game theory emphasizing the individual as maker of strategic choices among alternative courses of action; and (3) a social psychology emphasizing the role of environmental learning on the behavior of people acting within various situations. The major hypothesis of such a cultural ecology, when applied to the problem of voluntary action, is that given sufficient experience and familiarity with situations, people will behave cooperatively or competitively as predicted by the objectively discernible characteristics of those situations. Additionally, this approach leads to more questions than does a simple disclosure of the common interest or shared motive of group participants. It is insufficient to describe only why a group forms, however interesting this may be. We should also account for participation levels in the group, why the group is not active all the time, and what inhibits the group from taking on more and more social functions.

The key idea in cultural ecology is that recurrent human behaviors must be adaptive. Minimally, a behavior pattern is adaptive if it exhibits by its occurrences a sensitivity to changes in pertinent contextual variables. "Adaptive" usually takes a more extended meaning, however, stressing the comparative advantage of the behavior pattern for the organism, group, society, or species manifesting the behavior. Sharing scouting reports

within small cliques is adaptive behavior in this extended sense, at least under certain conditions. There are benefits to be had through cooperation that are for the most part unattainable through independent actions.

The adaptive advantages of sharing information are not free of certain fluctuating aspects of the more encompassing, ecological contexts of the Inside Waters fishery. Hook-off conditions inhibit the size of the groups, cannery quotas suppress their activities altogether, and some skippers can achieve similar results through different means. In other words, there are hierarchies of contexts, each level requiring its own analysis. Human action takes place in complex settings.

The immediate context of information sharing is the decision process of skippers as they try to gauge states of affairs in the fishery and select wise courses of action for their boats. The outcomes of these strategic decisions, more than anything else, determine whether a skipper and his crew win or lose in seining. Thus, I liken seining to a complicated sort of gaming. The objectives are specified (make money, win prestige), the procedure for achieving those objectives is outlined (how to select seining locations given various sorts of information), and player-to-player interactions are discussed (relative catch size fixes prestige, where other boats decide to fish affects each, etc.). In this game theory framework, the information-sharing cliques are temporary coalitions forming as part of the strategic maneuvering of skippers in an otherwise very competitive situation: what is perceived on a seasonal time frame as an n-player non-zero-sum game for money and an n-player zero-sum game for prestige.

The motivation to cooperate derives from the fact that the movement patterns of salmon and other boats (their laws of motion) are only imperfectly known. Hence, the utility of information on their whereabouts is not time-invariant. Taking advantage of this, small groups of skippers achieve a synergistic effect by sharing information as they scout for salmon the day before openings begin. The utility of their jointly produced information is greater than what could be produced were each to act independently. With respect to this one kind of cooperative behavior, I propose the following general hypothesis: Other things being equal, people will share information whenever it is used as data for laws of motion that predict future states of the system with conditional probabilities rather than with deterministic relations. In such situations, information sharing is synergistic, and this will induce even competitors to cooperate.

notes

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¹ There is a research tradition in social psychology, seemingly independent of that in economics, which studies this phenomenon. In 1927, German psychologist Walter Moede reported some findings of his student, Ringelmann, who had discovered that groups of people pulling on a rope pulled with less force than would be expected from summing their independently measured capabilities (Ingham, Levinger, Graves, and Peckham 1974:371). This "Ringelmann effect" was thought to be caused either by problems of coordination or of motivation loss in the group situation (Steiner 1972). The phenomenon was relabeled "social loafing" by Latané, Williams, and Harkins (1979), and it is becoming an active research area in modern social psychology (e.g., Harkins, Latané, and Williams 1980; Kerr and Bruun 1981; Harkins and Petty 1982).

² Most boats are either owned outright by a particular fish-processing company or have traditions of selling to only one company. Thus, when quotas are imposed, the companies buy only from "their"

boats. A seine boat that has inadvertently caught more than the daily quota may well have to throw away the extra fish (they spoil if not processed) or make a free gift of them to another boat.

³ Assistance to boats in trouble tends to balance out over the years. Hence, each gift of labor or parts can be seen as a form of "delayed balanced reciprocity" (Sahlins 1965). Spare parts are always repaid, but gifts of labor are among friends, even if outside a clique, and partake somewhat of a "generalized reciprocity" ideology. The exchange of information is straightforward "immediate balanced reciprocity."

⁴ One solution to this problem is to compute how many times area X is better than other areas for each dimension of contrast. The area which is better than other areas the most often is the "best" area. Using the matrix in Figure 1, for example, this computational procedure shows that area A is better than area B and equally as good as area D. My thanks to F. K. Lehman for telling me of this method.

⁵ These informal rules are sometimes intentionally broken by a skipper to test the aggressiveness of others and to see if they are willing to take reprisals. An adequate discussion of these matters would require a separate paper.

⁶ This is a simplification. Actually, if more than the optimum are working a given hook off, they set up several different rotation lines for different "positions." The preferred position is against the shore and setting toward the flow of the tide. The next line to form is usually the reverse of this preferred position, that is, against the shore but setting away from the flow of the tide. The situation gets more complicated when ten or more boats are at a hook off. The simplification in the text does not distort the basic point that two or three boats is the optimal number.

⁷ Obviously, this is an empirical question. The prisoners' dilemma of commercial fisheries could lead to an increase in competition resulting in an even greater "tragedy of the commons" (Hardin 1968). Here I express my hopes that fishermen are becoming more aware of management rationales, and because of this they are not doomed to fulfill the more dismal economic models but can creatively alter the fundamental political economy of fishing.

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