Social Networks and Cognition in Commons Dilemmas:
A Field Survey of Pacific Salmon Fishers and
A Laboratory Simulation of a Commons Dilemma

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ABSTRACT

Commons dilemmas arise from the conflict between acting in one's own self interest and acting in the interest of a larger group - in relation to a shared limited resource (e.g., water, air, trees, space, the pool of "financial resources" in collective bargaining for wages, etc.). The "Commons Dilemma" is a central problem that cuts a theoretical swath through the social sciences, as well as a number of other disciplines. This thesis involves examining commons dilemmas from a social psychological perspective.

It examines data collected from two exploratory studies of the commons dilemma: 1) a field-survey of Westcoast salmon fishery participants; and 2) a laboratory study of university undergraduates engaged in a computer simulation of "fishing" from a shared "pool". An important theme running through the two studies is the interrelation between social network processes, cognition, and behavior in commons dilemmas. Social networks influence their members' attitudes, interests and ultimately, their behavior. Findings from the field-study suggest that among members of the sample belonging to a fishery-related social network makes salmon fishers more keenly aware of the limits of the resource, and can lead to cooperative behavior, and the adoption of positive resource management strategies in certain situations. Findings from the laboratory computer simulation suggest that whether people think of themselves more as

individuals or as group members correlates with a number of attitudinal variables, and influences their harvesting behavior.

From these findings, it is argued that social network analysis might be a useful research application for future inquiry into the problem of the commons, especially when approaching it from a social psychological perspective. Further, it is proposed that one strategy for attempting to solve commons dilemmas is to make use of group processes as a conduit for transmitting both information about such dilemmas, and social values that might help to protect shared limited resources.

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Chapter 1

INTRODUCTION

This thesis examines both field and laboratory research on the topic of the commons dilemma. Commons dilemmas occur when an individual is forced to choose between self-interest and societal interest with regard to the usage of a shared limited resource (e.g., water, air, trees, space, fish, the pool of "financial resources" in collective bargaining for wages, etc.). The logic of the dilemma dictates that self-interest is rational for the individual, but if pursued by all societal members, will eventually lead to lower payoffs for all, and threaten resource disaster.

Background to the Commons Dilemma Concept

The Tragedy of the Commons

The intellectual origins of the commons dilemma lie in the classical political economy of the late 18th and early 19th centuries. Adam Smith's (1776) well known concept of "the invisible hand" represented the idea that an individual benefits the whole community by acting in his own self interest. This idea seemed true in view of the seemingly unlimited natural resources that existed at the time that Smith wrote.

In contrast to Smith's view, William Lloyd (1837) drew upon the analogy of a group of herdsmen sharing a common pasture to show that people must learn to cooperate and must refrain from acting in their own self interest, in order to maintain the greater interest of the collective community. If too many people "defect" from the group's interest, resource extinction becomes a strong possiblity. Hardin (1977) illustrates Lloyd's prescient observation in this way:

> The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.
>
> As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component.
>
> 1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.
>
> 2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for any particular decision-making herdsman is only a fraction of -1.
>
> Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit-in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all (Hardin, 1977:20).

Hardin's (1968) work represents the first major contemporary analysis of the commons dilemma. Hardin noted that there are no effective technological solutions to this problem, but only a moral one - mutual coercion, mutually agreed upon.

Since Hardin's original (1968) article,[1] the commons problem has been studied by academics from a variety of disciplines (e.g., see Hardin and Baden, 1977).[2] It is a central problem that cuts a theoretical swath through a number of disciplines, including political science, geography, sociology, economics, law, philosophy, public administration, biology, and psychology. My thesis involves an examination of the commons dilemma from a social psychological perspective.[3]

In particular, I wish to consider how social networks influence people's perceptions, attitudes, evaluations and behavior in commons situations. In order to see how networks are involved in the commons, let us return to Lloyd's analogy of the commons dilemma. Picture an open pasture or "commons" beside a small village in the England of Lloyd's day. Farmers from the nearby village graze their cattle in the pasture. The village is small, the villagers all know one another quite well, and comprise a close knit community. Many of the farmers are related through marriage. Some have grown up in the village, and have been childhood friends with one another. Others are acquainted with one another through business transactions. In short, the farmers are interconnected to one another through a network of social relations. Through these social ties, they discuss farming methods, and compare farming successes and failures with other network members. The farmers may have developed a great deal of trust in one another, through repeated exchanges of various kinds - mutual assistance, bartering, trading, and the like.

Through their farming experience, and the knowledge passed on down to them from their forefathers, the farmers have come to realize that the pasture land can sustain only a limited number of animals. Over the years they have come to an informal arrangement that each family will graze only two cows on this grassy commons. Because their numbers are small, and the farmers are highly familiar with one another, this norm restricting the number of cattle on the pasture is easily enforced. Occasionally when calves are born, their owner has to be reminded to sell or slaughter one of his cattle so that the number grazing on the pasture will remain constant. This is usually unnecessary, though, as the farmers trust one another and readily comply with the arrangement.

Imagine that this system continues successfully for many generations. In time, however, the population grows and the village becomes a small town. Some of the families who had kept cattle on the pasture have moved to other districts or taken up new occupations. New farmers from the town and surrounding districts begin keeping cattle on the pasture. They are strangers to the old farmers, and are viewed with a certain amount of distrust.

After a time, several of the new farmers decide they can make more money if they add more cattle to their herds. In the old days, farmers were dissuaded from adding extra cattle to the pasture by their fellows. Farmers were concerned with how they would be viewed by other farmers and by their fellow villagers if they defected from the group's interest. In particular they were afraid of being ostracized from social relationships that involved material exchanges. Thus, everyone complied with the norm of keeping only two cows per family on the shared pasture. The new farmers, however, do not feel obliged to follow this

custom, and begin to increase their herds. In time, one after another, the older farmers decide it is not fair that some farmers should only have two cattle on the pasture while others keep more than two - and reap the profits. The older farmers no longer feel they can restrain others from adding to their herds through moral persuasion, and are unwilling to engage in force. In the end, they too begin to add cattle to their herds.

After a while, the pasture starts to thin. It becomes dry and brown in patches. The cattle, which had once been very large and healthy, become thinner and many of them succumb to disease. The tragedy has begun ... .

As this hypothetical example illustrates, social networks provide a context in which social norms evolve and are enforced. Network structure influences patterns of communication among members, and provides individuals with social reference points that play a major role in shaping the way in which people perceive the world (Erickson, 1982) as well as influencing how they evaluate their outcomes (Gartrell, 1987).[4] Social network characteristics can influence the visibility of actors in a social system, and by affecting visibility and patterns of communication, can influence "contextual" psychological variables, such as trust, that play a key role in the commons.

Social psychological laboratory research has tended to overlook group influences in the commons dilemma. I address these gaps with a laboratory study that examines the impact of network associations on people's cognitions and behavior in a simulated commons dilemma. In particular, the experimental literature has suggested that formation of a strong group identity on the part of participants in the commons will lead to cooperative behavior and hence resource

conservation (see Brewer and Kramer, 1986). I examine the relation of social identity to cognitions and behavior in a commons. I also ask whether social class background, defined in network terms, has any bearing on the commons situation.

Since few real world studies of the commons have been attempted, I also undertook an exploratory field-survey of Pacific salmon fishers. This research was carried out in the summer of 1985. Questions used in the survey were drawn from previous laboratory research (e.g., see Dawes, 1980), and from theoretical discussions of the nature of commons dilemmas (e.g., Hardin, 1968; Edney, 1981). The questionnaire items focused on communication, trust, visiblity of participants, understanding of the dilemma, resource perception, and a number of specific attitudinal items. Analysis of the field-survey data focuses on the relations between fishers' network membership, interpersonal processes (such as communication and social pressure), and fishers' resource perception, attitudes, and justice evaluations.

The two studies that form the basis of this thesis are complementary in several respects. The field-survey was based in part on past experimental research, but also explored some previously unresearched variables (e.g., socio-political attitudes; the social values of freedom and equality; and attributions). The lab study served in part as an extension of the field-survey by examining social network influences such as social identity and social class. Thus there is some overlap between the two studies.

The two studies are also complementary in that they tackle the problem of the relation between the group and the individual from opposite directions. The field-survey examines network membership, a social variable. The lab study

focuses on social identity, a psychological variable, which is the component of the self-concept which relates the individual to groups.

Organization of Thesis

The organization of the chapters that follow is somewhat unconventional. Instead of devoting separate chapters to research design and methodology, and results, these headings are included as subsections in two chapters: one devoted to the field study, the other to the lab study. The thesis has been organized in this manner to enhance its continuity.

In Chapter Two, theoretical perspectives and past research on the commons problem are reviewed. This survey will be conducted in the context of a social network perspective. Chapter Three begins with a discussion of the Pacific salmon fishery as an example of a real world commons dilemma. The research design and methodology, results, and conclusion sections of the field-survey study follow. In Chapter Four, a background to the laboratory simulation study is provided. Following this, are the research design and methodology, results, and conclusion sections of the lab study. In Chapter Five the significance of the two studies and their interrelation are summarized, and prospects for future research are discussed.

Notes

1 Crowe (1969) has pointed out that Hardin (1968) merely rediscovered the tragedy of the commons - for knowledge of this tragedy is quite common in the social sciences. Crowe refers the reader to the work of Olson (1965). Olson (1965) outlined that the existence of a large group with a common interest does not automatically give rise to collective action. He argued that

there must be an individual incentive to join in or there must be compulsion, for collective action to occur. Further, Olson noted that small groups are qualitatively different from large ones.

2 The commons dilemma is a special case of the larger category of problems which have come to be known as "social dilemmas". In the last decade and a half, a great deal of laboratory research has taken place within the domain of 'psychological social psychology' examining social dilemmas. A social dilemma arises from the conflict between an individual's choice of whether to act in his/her own self-interest, or in the interest of a larger group of which s/he is a member. When this choice involves making a decision regarding a limited resource, the ensuing dilemma has come to be known as a "commons dilemma". More specifically, commons dilemmas can be defined as having the following two properties: 1) the social payoff to each individual for defecting behavior is higher than the payoff for cooperative behavior, regardless of what the other society members do; yet 2) all individuals in the society receive a lower payoff if all defect than if all cooperate (Dawes, 1980).

Commons and other social dilemmas can exist for different periods of time. For example, in a burning theatre it is in the interest of the group (or audience) that everyone leave the theatre in an orderly (calm and collected) fashion and not panic, so as not to block or jam exits, or trample people (and create further panic and chaos). From an individual standpoint, especially if one was seated in the centre of the theatre, it would be in his/her interest to get out of the theatre in any fashion s/he could, as quickly as possible - therein the collective dilemma. This dilemma situation would hypothetically take place in a very short time frame, perhaps in a matter of moments. Another example of a

commons dilemma would be pollution, in particular, littering. It is generally in an individual's best interest to litter, because holding on to garbage until it can be disposed of properly can be an inconvenience, while littering on the other hand, is easy and quick. It is in the society's interest, at least from an aesthetic point of view, that everyone dispose of his/her garbage properly, in agreed upon disposal containers. Although the act of littering takes place in a mere second or two, people generally develop a pattern of littering or not littering. Furthermore, litter usually accumulates over a protracted period of time. Thus, it is apparent that the two types of commons dilemmas I have described have substantially different properties. Specifically, the former happens during a very brief period of time, and may happen only once for many of the individuals involved, while the latter occurs over an extended period of time or more precisely, repeatedly over an extended period of time. Although both of these types of dilemmas are important and need to be studied, this thesis is concerned only with those types which occur over a substantial period of time (i.e. patterns of behavior over time). Even commons dilemmas as I have defined them, however, can be analyzed in terms of short term versus long term interests. That is, an individual's long term interests often may overlap with the larger society's long term interests, while his or her short term interests if defined strictly in terms of external payoffs rarely will.

Some examples of other commons and social dilemmas include choosing whether or not to engage in the following activities: polluting the environment in various ways, irresponsibly passing on venereal disease, asking for "too much" in a collective bargaining agreement and thereby driving up inflation, catching too many fish, cutting down too many trees, having too many children.

3 Many treatments of the commons dilemma problem (including Hardin's), have been based on the "rational man" depiction of human nature as espoused in the tenets of classical economic (e.g., Adam Smith, 1937), and political theory (e.g., Thomas Hobbes, 1946). In particular, numerous economic treatises (for instance, see Fife, 1971; Clark, 1974) discuss people's behavior in commons dilemmas mainly in terms of the costs and benefits of hypothetical actions.

Experimental social psychology has broadened the focus by examining the effects of social interaction and cognitive variables in addition to the influence of the payoff structure on behavior in commons dilemmas. The findings from these studies are limited, however, because most have been conducted in laboratories. The following problems constrain generalizing findings from the laboratory to real world settings: 1) laboratory based studies are usually conducted with university undergraduates serving as subjects; 2) laboratory settings are usually quite artificial and exclude contextual factors involved in real world dilemmas; and 3) laboratory studies have tended to focus on the individual and have largely overlooked group level processes.

4 Groups influence the way people view the world. To a certain degree this relationship is one of reciprocal causality. People are more predisposed to join groups and organizations which mirror their view of the world, than those that do not, and in turn have their world views reinforced and modified by joining and interacting in such groups.

People's utilities for certain resource behaviors, and their perception of the resource itself, are influenced by social interaction. People acquire knowledge about the environment (in part) through conversing with others. In fact, people's perceptions about the environment and shared resources can be

influenced by cultural and socioeconomic factors (see Barker, 1976; Bell et al., 1978). Network influences are involved in commons dilemma situations to some degree in setting normative standards for resource relevant behavior. Group processes other than influence and conformity are also probably involved in determining behavior in such situations. Research on distributive justice has shown that groups provide the context through which people make evaluations of fairness or justice (e.g., Gartrell, 1982). In commons dilemmas, groups may provide the context in which people compare their shares of a resource and make justice evaluations.

Chapter 2

REVIEW OF THEORY AND PAST RESEARCH

The bulk of social psychological research into the commons dilemma has been conducted using experimental games. Often, these games serve as analogies for real world commons dilemmas. Most of this work has been relatively atheoretical, progressing from an examination of one variable's effects to those of another. A limited number of micro- and macro-level theories have been developed to explain commons dilemmas. For the most part, however, both theories and research concerning the commons problem have neglected social structure.

The central aim of my thesis is to examine the influence of structure in the form of social networks on cognition and behavior in commons dilemmas. To this end, I will now undertake a review of past research and theory pertaining to the commons problem. In undertaking this review, I will examine the variables and theories that have been explored, by setting them in the context of a social network perspective.

Social Network Analysis

Social network analysis refers to a body of social science approaches that attempt to explain social behavior and related phenomena by analyzing relations between concrete social entities, e.g. persons, groups, organizations (Gartrell, 1987). The relationships between individuals or larger social groups can be

depicted, using specific binary relations, as either being tied or not tied to other social units. Tie "strength" can also be defined in network analysis. The network can be represented in a matrix or graph and can be analysed using advanced mathematical techniques, such as graph analysis and multidimensional scaling (Marsden and Lauman, 1984).

Social network approaches, in their many forms, have striven to provide a social science perspective that is highly concrete and nonreductionistic. Social network analysis, in my view, is a perspective that may be of relevance for future sociological inquiry into commons problems.

Network membership is related to a number of variables in commons dilemmas. These variables pertain both to characteristics of the resource and of the participants in resource commons. Being a member of a social network provides an individual with social ties and facilitates communication channels between similar others and/or with others who share some subset of common interests. Communication with relevant others allows information to be shared, and facilitates the development of various attitudes for both communicating parties.

The following discussion will be somewhat unconventional in that it entails an exploration and review of work that is potentially applicable to the commons problem in addition to reviewing past research within the paradigm. In undertaking this discussion I will draw upon the salmon fishery[1] analogy for the purpose of illustrating how social networks may be implicated in commons dilemmas. The variables to be discussed below were selected because of their obvious relation to network processes. Many of the variables to be described have been examined within the context of N-person game research, and I begin with that tradition.

Gaming and Game Theory

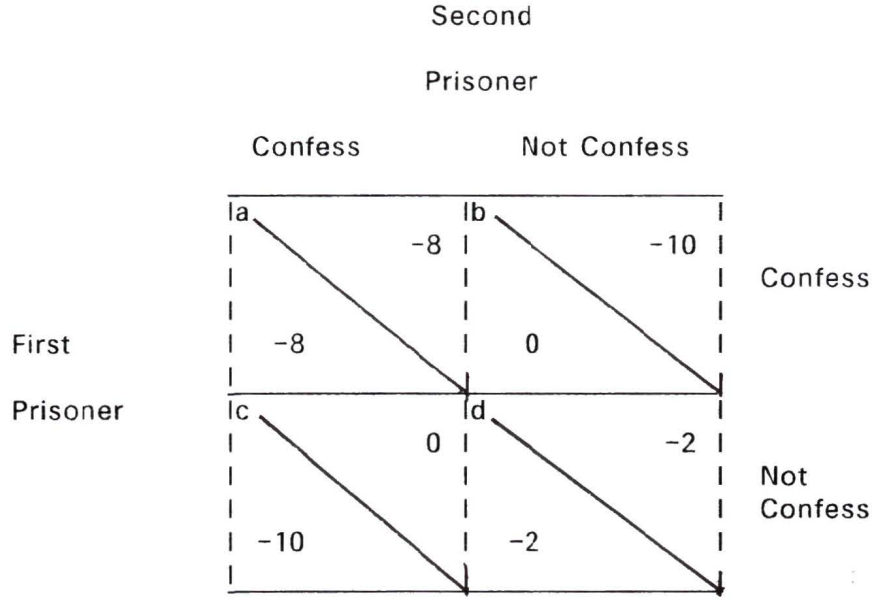
The classic experimental game studied by social scientists is the Prisoner's Dilemma (see Luce and Raiffa, 1957; Rapoport and Chammath, 1965).[2] The prisoner's dilemma is constructed on the following anecdote. The police arrest two individuals who are suspected of commiting a serious crime, such as murder. The police do not have enough evidence to convict them unless one of the prisoners confess. The police do, however, have enough evidence to convict the suspects on a lesser charge such as theft. The two prisoners are held and questioned separately. They have the choice of confessing to the more serious crime, or remaining silent. The police try to induce confession by employing the following payoff structure. If one prisoner confesses and the other does not, the first prisoner gets released from prison while the second receives a ten year sentence. If neither of the suspects confess, both will be convicted of the lesser crime, and both will receive a sentence of two years. Finally, if they both confess, both will be sentenced to eight years in prison (see Figure 2.1).

What will the prisoners do? For each prisoner acting in a self-interested manner, it is rational to confess - unless he can be sure of what the other prisoner will do. For instance, if the second prisoner confesses, the first prisoner will receive eight years if he also confesses (see cell a), but ten years if he remains silent (see cell c). If the second prisoner remains silent, the first prisoner will be released if he confesses (see cell b), but will receive a two-year sentence if he remains silent (see cell b). Thus, in both scenarios it is rational for the first prisoner to confess. Of course, this payoff matrix is symmetrical. If one assumes that both individuals in this dilemma will act in a self-interested manner, the likely

Figure 2.1

Payoff Matrix for the Prisoners' Dilemma

Based On Years In Prison



outcome is that both prisoners will confess and both will end up in jail for a combined total of sixteen years (see cell a).

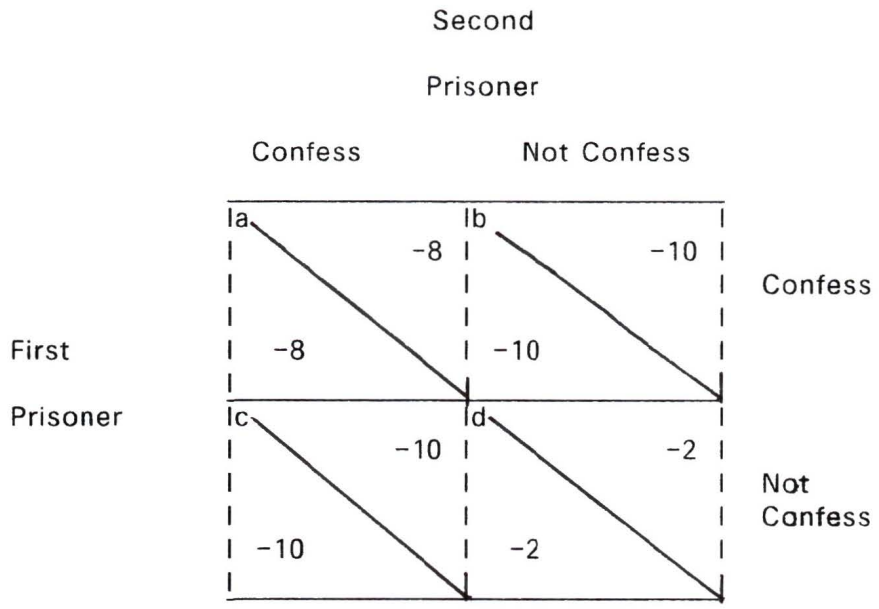
Heath (1976) notes that the structure of this situation changes, however, under the influence of norms and sanctions. If there are incentives to remain silent, such as a norm of 'honour among thieves' enforced by other members of the criminal subculture, then the payoff matrix will be altered (see Figure 2.2).

If confession is punished and silence rewarded, and if these rewards and penalties are sufficiently large, then the situation changes from one involving both common

Figure 2.2

Payoff Matrix for the Prisoners' Dilemma

Based On Norms and Potential Sanctions from Other Subculture Members



and conflicting interests to one whose structure induces cooperation. It becomes rational for both prisoners to remain silent and endure two years in prison (see cell d), rather than for each to confess and receive eight year prison sentences (see cell a). Such sanctions transform behavior that would otherwise be irrational into a rational pursuit of self-interest (Blau, 1964; Heath, 1976).

Social networks provide the context in which social norms are established and maintained. I would argue, therefore, that social networks can influence the payoff

structure governing people's behavior in commons dilemmas, with the consequence that rational action is transformed so that self-interest is no longer in conflict with group interest.

A great deal of empirical work has been done by social psychologists studying experimental "game" simulations of social, and commons dilemmas. Many of these games have been structured so that the payoffs of the game resemble those of real life social dilemmas. The majority of these simulations have taken the form of N-person games. An N-person game is a game for more than two players. N-person games are thought to resemble real life situations more than two person prisoner dilemma type games, and are thus now more frequently used than the latter. One reason for the popularity of N-person games over two-person games is the increased number of possible outcomes of the game.

Dawes (1980) has noted that the structure of the payoff matrix, and the importance of the resource to the individual, are two very important predictors of behavior.[3] He argues that the simplest way to elicit cooperative behavior is to change the payoff structure of a given situation. He states that when a social dilemma is uncovered, an effort can be made to extinguish it through appropriate choices of rewards and punishments for cooperative and defecting behavior. After this has been achieved, the situation is no longer a dilemma. Dawes comments, however, that the simplicity of this approach is appealing until we ask the question, "who will change the payoffs and how" (a problem likely to elicit cynicism from various corners). He describes a number of behaviors that involve rejecting a payoff that is larger for one that is smaller. For example, he notes that many people give money to public television or to the United Way, even though

they know that their small contribution will make no difference in terms of the services rendered. Most people take the trouble to vote, even though they know that the probability that an election will be decided by a single ballot is extremely low. And some couples desiring a large family do in fact limit its size not out of desire but out of a belief that it is not moral to have too many children. These scenerios give rise to the concept of utilities. People making such decisions have utilities that determine their behavior; "utilities associated with aspects other than the external payoffs they would receive" (Dawes, 1980:175-176). Thus, if a person chooses action A over B, then A must, by definition, have greater utility; if simultaneous action B provides a higher payoff in terms of economic benefits or security then, by definition, other utilities must be guiding the individual's choice. The problem, Dawes emphasizes, is to assess what these utilities are and to study their role in encouraging cooperative behavior. It is possible, Dawes maintains, to have a social dilemma represented by a payoff structure and yet have people cooperate. The reason for this, he argues, would be that the individuals' utilities do not present them with a dilemma. The utilities most important in eliciting cooperation are those associated with following social norms, obeying dictates of conscience, and altruism (Dawes, 1980).

As noted in the illustration of the prisoner's dilemma above, social ties to others can influence the rewards of the payoff matrix. Presumably, social rewards could be studied in n-person game theory, but little interest has been shown in this problem.

What empirical evidence is there for rational behavior as depicted by game theory, in everyday life? One example is the work of Brown (1965) and Berk (1974),

who have moved out of the laboratory and applied gaming approaches to real life situations, in particular, to the study of crowds. Berk (1974) argues that crowd participants exercise a substantial degree of rational decision-making while consciously trying to produce concerted rewarding actions.[4] Networks can have a dramatic effect on collective action in such situations, as Granovetter (1978) has demonstrated in his work on threshold approaches.

The validity of game simulations appears to be an open question (Gifford, 1987:394). However, many participants seem to get so caught up in the simulations that their behavior resembles that of what one would expect in real world dilemma situations (see Bonacich, 1976; Dawes, McTavish and Shaklee, 1977).[5] Generally, such experiments are intended to test theoretical rather than empirical relationships. The validity of such experimental games, in my view, can only be supported or refuted by comparing and contrasting experimental research with real world studies (e.g., observational field studies, interview studies of people involved in real world situations).[6]

Other Theoretical Perspectives

In addition to gaming, a number of other approaches have been proposed to account for commons and other collective dilemmas. The first of these, tragic choice theory, constitutes the only "macro-level" theory that has been developed for explaining commons dilemmas.

Tragic Choice Theory

Tragic choice theory, as its name implies, takes a somewhat pessimistic perspective on collective dilemma situations (Calabresi and Bobbit, 1978). It asserts that inequality and the resulting scarcity and suffering are "natural" and, therefore, nearly impossible to change. Tragic choice theory argues that scarcity originates in a conscious decision not to produce as much as could be produced; this is called a first-order determination. For instance, not producing as much of some agricultural product in order to "stabilize prices", thereby assisting or enriching producers at the expense of other members of the commons, or collective society. Second-order determinations concern decisions which are made about the distribution of these artificially scarce goods.

Edney (1981) has argued that in order to disguise the conflict between the ideal of equality and the fact of non-equality, various strategies are employed to support second-order determinations. Examples of such a strategy would be publicizing the occasional charity event for the needy, or referring to the fact that we live in a free market/society in which individuals are free to buy from others - or work harder to get ahead themselves. At the micro-level, tragic choice theory predicts that individuals will engage in self-interest because we accept (at least some of) these justifications for "getting ahead" by overusing the commons. No specific solutions for this scenerio are proposed by Calabresi and Bobbit, other than their emphasis on the fact that society members need to be more honest and responsive to the influence of their actions on the plight of others.

Social network analysis could be applied to several aspects of this theory. For instance a network approach could be used to examine the linkages between

producers. Substantial research has been conducted examinig interlocking directorships between corporations (e.g., Scott, 1979; Carroll, 1986). This type of research could be applied to examine the linkages between firms in commons situations, to explore first-order determinations. Second-order determination corresponds to the problem of distributive justice - which will be discussed later in this chapter.

Social Trap Theory

Social Trap Theory, as espoused by Platt (1973), is based on reinforcement theory. Platt defines a social trap as the phenomenon which occurs when a behavior that results in an immediate reward leads to a long-term punishment. The primary reason that commons are mismanaged, according to social trap theory, is because reinforcements for public interest acts are smaller than those for self-interest acts. In fact, not only are they smaller, they are often offered long after the occurrence of a given act. For instance, an imperceptible decrease in taxes at some point in the future for refraining from littering today. Platt suggests that in order to solve these dilemmas we need to dispense with freedom, and hand over power to an authoritarian but benevolent third party. In this regard, Platt's position is heavily influenced by the ideas of B.F. Skinner (1971).

Platt's theory has been criticized for being overly reductionistic and ignoring social relations (Edney, 1981). It should be noted that social networks provide a context in which sanctions can be employed against individuals who act in an overly selfish manner. They also provide a social structure in which prosocial behavior can be positively reinforced.

Social Evaluation Theory

Social evaluation theory is not a theory per se, but rather a body of related and intersecting theories, some of which have been linked explicitly to the commons dilemma (Gifford, 1987). The central concept of social evaluation theory is that human beings learn about themselves by comparing themselves to others. The tenet following from this observation is that the process of social evaluation leads to positive, neutral, or negative self-ratings which are relative to the standards set by the individuals employed for comparison. These ideas are central to the core of early social psychological thinking, especially in the writings of Cooley (1902) and Mead (1934). Social evaluation includes theories of reference groups, social comparison, equity and justice, relative deprivation, and applications such as social support, class consciousness, and the diffusion of innovations (Gartrell, 1987).

Social Comparison, Equity and Distributive Justice Theory

Festinger's (1954) social comparison theory holds that humans are driven to evaluate their opinions and abilities. It argues that people first attempt to evaluate their opinions or abilities through objective, non-social means. If such means are lacking, people will evaluate themselves through comparisons with the opinions or abilities of others. In the commons situation, comparison has been implicated in the formation of beliefs relating to conservation (Erickson, 1982), and in the way people judge whether or not they are receiving a fair share of the common resource. Equity theory deals with the fairness reactions that follow from such comparing.

Equity Theory

Adams (1965) synthesized cognitive dissonance theory (Festinger, 1957), Homans's concept of distributive justice (Homans, 1961), and social comparison theory (Festinger, 1954), in formulating his theory of inequity in social exchange (see Suls and Miller, 1977). Adams argues that comparison is not restricted to attitudes and abilities but also includes an individual's "inputs" such as effort or qualifications and "outcomes" such as pay. Adams's theory states that individuals compare the ratios of their inputs and outcomes to those from a similar situation to determine whether they have been treated fairly or justly. For example, Employee A compares her salary (outcome) with respect to the time, effort, and qualifications she puts into her work (input) with a similar ratio for Employee B in a similar situation. Inequity results when these ratios are perceived as unequal. Adams theorizes that the perception of inequality promotes tension, which leads either to behavior change, in order to equalize the ratios, or to a cessation of comparison.

Equity theory has been proposed as a theory that is applicable to commons problems (see Gifford, 1987). Gaming approaches and equity theory both deal with people's actions and reactions to various payoff structures, and the actions of other participants in simulation experiments.

With reference to commons dilemmas, Gifford (1987:395) states:

> However, equity theory does not take the limited commons into account; if there are too many individuals, all working hard, the pool of resources cannot provide them all with just rewards. Furthermore, while the orginal theory asserted that individuals act to achieve equity, more recent writers have argued that many individuals will go beyond equity to maximize their own relative outcomes. Those who do so tend to develop a rationale to support the resulting inequity and, in fact, reinterpret it as equity (Walster and Walster, 1975). This is possible because of our ability to mentally "massage" equity into

> inequity and vice versa. The frightening implication of this for social dilemmas is that individuals may rush headlong toward destruction, completely convinced that no social dilemma exists or that their own defection is actually cooperation.

Gifford argues that the important contribution made by equity theory is the inclusion of cognitions, and of particular importance, the theory's assertion that we have the ability to distort outcomes "so that they seem equitable to us".

A broader concept, distributive justice, incorporates many of the tenets of social comparison and equity theories. Distributive justice is concerned with the ways in which socially valued rewards, such as salaries, promotions, or privileges are allocated to members of social systems. Its basic notions are that rewards are allocated to actors on the basis of socially defined and evaluated characteristics. The amount of a reward allocated depends on the state of the characteristic, which in turn is evaluated by comparisons between actors. If two actors possess similar states of the characterstic(s) being evaluated, they should expect similar amounts of reward. If similar actors receive unequal rewards or if dissimilar actors receive equal rewards, then normative expectations are violated. When this happens strain is produced, and pressure develops to change the situation (Berger et al., 1972).

Many distributive justice issues arise in commons dilemmas, the foremost of which centres on the issue of allocation of the resource itself. For instance, throughout the history of the B.C. fishing industry, there has been substantial tension and conflict between the federal government and different fishing interest groups over the allocation of salmon. Distributive justice is an important issue that requires further examination in real world commons. It can also be explored in the context of social networks. As outlined above, distributive justice theories

state that people make evaluations about the fairness in resource allocation by making comparisons with relevant others. These evaluations are important because they lead to action to restore a sense of fairness of resource allocation. Social network analysis can be used to map out the "referents" individuals utilize in making such evaluations. Research on the justice of pay suggests that networks provide the comparative frameworks within which fairness is judged.

Gartrell (1982,1985) conducted a field study which examined how blue collar workers evaluate the wage rates of others in comparison with their own pay.[7] He found that networks channel information about others' pay rates, and in some cases, act as barriers to the visibility of socially distant actors. The restrictions of workplace technology also influence others' visibility. Gartrell (1982) concluded that his results contribute in part to solving the problem of accounting for the visibility of comparative referents from which comparison choices ultimately are made. Workers' accounts suggested a number of perceptual, interactional, and rational sources of pay information. Whether similar forces are at work in commons situations is an open question.

In resource commons, perceptions of inequity of resource allocation on the part of participants in the commons could lead to behavioral change in resource harvesting. This observation points to the importance of studying social evaluations in the context of social networks in commons dilemmas.

Reference Group Processes

A reference group refers to a set of people whose beliefs and behavior are taken by an individual as a basis for evaluating important aspects of his or her life. In discussing reference group theory, Merton (1957) states that the theory centers on the processes through which people relate themselves to groups and refer their behavior to the values of these groups.[8]

Sherif (1968), one of the pioneers of reference group research, further elaborates: "The general problem is obviously that of the individual-group relationship." In discussing the nature of this problem, he notes that in contrast to the previous individualistic emphasis social psychology had been characterized by, "is the realization that group situations generate differential effects of significant consequences". Sherif maintains that group interaction is seen as the major determinant in attitude formation, attitude change, and other phenomena of great importance to the individual. States Sherif (1968:86),

> ... reference groups can be characterized simply as those groups to which the individual relates himself as a part or to which he aspires to relate himself psychologically.

He points out that this definition of reference groups is a psychological one, it is made from the standpoint of the individual in the individual-group relationship.

Sherif goes on to point out that not in all cases are individuals' reference groups at the same time their membership groups. However, he argues, that in cases where the membership group is not the reference group, it does not follow that the groups in which people interact will not have an effect on them.

In commons dilemmas the beliefs and norms of the group can serve as standards on which an individual bases his or her actions. As we have already

seen in prisoners' dilemma situations, group norms can play a considerable role in influencing behavior.

Reference group processes, such as comparison, influence, and conformity occur within the social relationships that make up social networks. Presumably, these processes require strong social ties such as occur within densely linked segments of networks, or "cliques" (Erickson, 1982), although some have suggested that face-to-face interaction may not be necessary for normative reference group influence to occur (Burt, 1982). Central to this network view of normative reference groups is the idea that an array of cognitive entities, (such as attitudes, values, beliefs, and norms, that have as their objects other people, oneself, various features of the environment, and the like) are influenced by association in interpersonal networks. All of these cognitive items have been dealt with in the commons literature, and I consider each in turn.

Social Identity

Social identity theory was developed by some of the same figures who were involved in reference group research (e.g. Sherif, 1968). Turner (1982) describes social identity as a subsystem of the self-concept. He defines the "self-concept" as a hypothetical cognitive structure which under appropriate circumstances mediates between the social environment and social behavior. Social identity, argues Turner, "is the cognitive mechanism which makes group behavior possible" (1982:21).

Although social identity theory concerns many of the same external phenomena as reference group theory (e.g., reference groups), it is more sophisticated in dealing with internal phenomena, such as the self concept. Social

group identity is a factor involved in determining people's utilities for cooperation versus defection in commons dilemmas. Brewer and Kramer (1986) cite Tajfel and Turner (1986), and Coleman (1961), in noting that research on social identity theory has demonstrated that self-interest may not always be defined at the individual level. Brewer and Kramer's findings reveal that the way in which people respond to a social dilemma, depends on whether they think of themselves as single and autonomous individuals, or whether they regard themselves as sharing membership in, and identification with, a larger social unit. They found that for subjects in a commons dilemma scenario, self-restraint increased under conditions where collective identity was made salient, in comparison with conditions when individual identity was emphasized. These findings lend support to the notion that group-egoistic motives, lead to cooperative behavior in social/commons dilemmas (see Lynn and Oldenquist, 1986; and Messick and Brewer, 1983).

Social Networks and Communication In Commons Dilemmas.

Information has been identified as an important variable in commons dilemmas (Edney, 1980). In social systems, particularly large ones, what constitutes cooperative behavior may not always be clear, while individual interests usually are. One way to help solve commons dilemmas may be to provide people with information about what constitutes "cooperative behavior" in such scenarios, and about the degree of impact their actions, and those of others, contribute to the fitness of limited shared resources. In some laboratory research it has been demonstrated that informing participants about the possible consequences of their actions can be effective in preventing commons problems (Stern, 1976). Other

laboratory researchers have found contradictory results (Cass and Edney, 1978; Edney and Harper, 1978b). Additionally, several authors have warned that information may be suppressed, distorted, or subject to other forms of manipulations in commons situations and hence may contribute to the dilemma (Hardin, 1977; Orbell and Wilson, 1978; Edney, 1980).

The effects of providing people with information about conservation strategies, have not been studied in real world commons. The size and structure of social networks can constrain or facilitate the flow (quality and quantity) of information about the resource and about participants in resource commons. One possible strategy for attempting to deal with commons problems would be to take advantage of social network effects, using social networks as conduits for disseminating information relevant to resource conservation. There is a need for field research in this area, a gap this thesis attempts to fill.

Information obtained from other social network members about the characteristics of a resource can, in part, shape an individual's perceptions of that resource. In general, it has been shown that cultural and socioeconomic factors can influence people's perceptions and attitudes about the environment and collective resources (Barker, 1976; Bell et al., 1978). This observation raises the question as to the potential utility involved in examining the effects of social comparison processes on the collective perception of shared limited resources.

The size, and the structural characteristics of a social network of people who share a limited resource should have an effect on the dispersal of such information in resource harvesting/allocation settings. The proximity of individuals to key others, such as central figures in a clique, is probably an important variable in the

dispersal of information relevant to behavior in collective resource dilemmas. Bonacich[9] has illustrated how the location of individuals in certain types of social network structures influences their motivation to communicate information in a social dilemma. He noted that information being passed on is restricted by the structure of the network. Drawing on a computer simulation of network structure and information transmission in a hypothetical social dilemma, he reported that the degree of centralization of a network determines the probability of successful communication in the dilemma. Bonacich concluded that networks with intermediate centrality create the greatest dilemmas for individuals, while highly centralized networks create the fewest.

Communication per se is perhaps the most obvious, and certainly one of the most researched variables in this paradigm. Dawes, McTavish, and Shaklee (1977), found 72% cooperation in their communicating groups, as opposed to 31% in their non-communicating groups in a laboratory game. Edney and Harper (1978b) examined the effects of individual responsibility and communication in a simulated resource management problem. Their results showed that communication produced a significant increase in "heroism" in group harvest, resulting from better management of the pool.

Brechner (1977) devised a laboratory analog to simulate conditions that produce "social traps". The maximum pool size and the ability to communicate were varied. Main effects were found for both, which indicated that the least effective resource management occurred when the pool was small and no communication was allowed.

In an unpublished study by the author (Tindall, unpublished research paper), a computer simulation of "the commons dilemma game" was developed in an attempt to replicate previous findings in a new format. The results of this study strongly supported the notion that communication is an important variable in developing and maintaining an optimal resource management strategy. The results of a post-experiment questionaire suggested that communication facilitates positive perceptions, behavior and attitudes towards others - leading to greater understanding of the dilemma and increased cooperation in resource harvesting. The importance of communication on cooperation seems apparent. Further research, however, is called for. Communication probably interacts with a number of other variables in affecting cooperation rates in commons dilemmas, for instance: territories, group size, public disclosure, moralizing, honesty, trust, personality, equity, and cognitive processing (Dawes, 1980; Edney and Harper 1978a).

That network structures should influence patterns of communication in commons dilemmas, has been observed by Bonacich and others (Bavelas, 1948, 1950). However, the structural determinants of communication have generally been neglected by social psychologists examining commons problems. There is some measure of irony in this state of affairs, in that communication has probably been the most studied variable in commons dilemma research, and the one which could be most readily examined from a social network perspective. This application will be elaborated in following sections of this chapter, when reviewing other variables of relevance in commons situations.

In addition to influencing an individual's perceptions about a resource's characteristics, members of an interconnected social group can purposefully exert some degree of control over an individual's resource harvesting by controlling information about the resource. The work of Cashdan (1983), an anthropologist, reveals how social network processes can indirectly influence the preservation of a limited resource for network members. The existence of territories has been noted by several researchers as a positive condition for enhancing resource preservation in commons dilemmas (and will be discussed later in this chapter). Cashdan has examined territoriality among the foraging Bushmen of the Kalahari. She argues that where territories are large and resources unpredictable, outsiders can minimize their foraging costs considerably if they obtain information from the residents concerning the location of resources; thus they have an incentive to seek access to the social group, since it is through social interaction that information exchange takes place. Bushmen, however, sometimes defend territorial resources by controlling access to the social group (and thus information) rather than by perimeter defense, and the costs of this form of defense are unrelated to territory size.

Cashdan's study provides a good empirical example illustrating the interrelation of social network ties and a scarce resource. Territoriality through control of information about limited resources, is an interesting potential issue for future social network research on the commons problem.

Information about Resource Harvesting Techniques

Information about resource harvesting techniques can be transmitted through social networks. Gartrell (1987) discusses the application of network analysis to the diffusion of innovations (also see Rogers, 1979). Granovetter (1973,1974) has discussed the importance of network ties in procuring employment. These two topics do not immediately seem to be related. However, Guppy (1987), has shown that employment in the Pacific salmon fishery is related to the diffusion of technical knowledge via social ties:

> The importance of family networks in fishing, atypical of recruitment patterns in most other occupations, is characteristic of small business operations. Family connections are important in the industry not only because it is from their fathers that young fishers can learn skills associated with navigation, gear, fishing locations, but also because it is from the family that the amount of capital necessary to become a fisher can be found. While people can still enter the industry as small-scale fishers, the increasing prominence in the fleet of expensive seiners and freezer trollers makes entry at this latter level difficult unless one has either family connections or a small fortune (Guppy, 1987:174-175).

Guppy notes that these findings parallel a rather well established sociological generalization. In occupations which require substantial capital investment and technical expertise, such as fishing, it has been observed that children are more likely to follow in their parents occupational footsteps (Sorokin, 1964; Guppy, 1987).

In the Pacific fishery, depletion of salmon stocks has resulted, to a large degree, from fishers increased capacity to harvest fish (Pearse, 1982). Boats are faster and better designed. Engines are more powerful, and nets more efficient. Freezers have been installed on many boats to permit more time expenditure on harvesting. The use of sonar helps fishers track salmon. The advent of C.B. radios has enabled fishers to communicate with one another from the cabins of their respective boats.

The adoption of such new techniques, occurs in a social context. Knowledge about technical innovations is often obtained through social network ties, and technological "norms" are subject to the same reference group processes discussed earlier. Social network ties are thus not only an important source of resource harvesting skills and employment opportunities, but are also a major conduit of technological innovation related to resource management.

Technological innovation plays a key role in most commons dilemmas. It is because of advancement in certain technologies that resources are being over-harvested, the environment is being degraded by pollutants, and over-population is occuring. Hardin (1968) flatly stated that technology will not solve "the tragedy of the commons", but that only moral action will suffice. This assertion needs to be tested empirically. For instance, with regard to fisheries, it is plausible that aquaculture (fish farming) may eventually help to preserve salmon stocks. In any event, the diffusion of technological innovations would seem to be a relevant problem for study by social scientists concerned with the commons problem.

Trust

Edney (1980:145) argues that,

> competitive behaviors are destructive in the commons, and we should therefore consider factors that tend to reduce competition.

Edney suggests that trust is a positive quality of mutuality in groups, and is a factor that is involved in group level solutions to commons dilemmas. He defines trust as:

> connoting that aspect of human behavior which involves mutual reliance in group situations but which at the same time promotes individuals willingness to risk constructive action for group benefits

> ... Its relevance to commons problems can be put concisely: In absence of trust (or the presence of distrust) among users of a commons, competition can reach its most destructive heights, with dire consequences for the shared resource. (Edney, 1980:145)

Dawes (1980) argues that utilities not connected with external rewards such as knowledge, morality, and trust will enhance cooperation in social dilemma situations, and are of particular importance to the noncoercive (and therefore efficient) resolution of many of the social dilemmas we face. Pearse (1982), author of the Canadian Royal Commission Report on the Westcoast Fishery, has emphasized the need for government to induce the trust and confidence of participants of the fishery.

Yamagishi and Sato (1986) have reviewed motivational aspects of the public goods problem that are related to trust. The public goods problem is a type of social dilemma, and is the inverse form of a commons dilemma. That is, public goods problems involve situations where the individual must decide whether to contribute to a common resource, while the commons dilemma involves situations where the individual must decide whether to take from the resource.

Yamagishi and Sato distinguish between public goods that are conjunctively produced, where the joint outcome depends on the weakest or least cooperative member, and those which are "disjunctively produced", where the public good depends on one or a few members' cooperative action. Yamagishi and Sato studied the effects of situational factors structured conjunctively or disjunctively on two types of motivation: greed and fear. Following Coombs (1973) they define "greed" as the active pursuit of self-interest, often referred in collective goods problems to as "free riding" and "fear" as the motivation for uncooperative behavior that is based on the lack of trust and the sense of helplessness. The

results of their experiment demonstrate that these two types of motivation are indeed situationally dependent. Fear is activated when a public good is conjunctively produced, while greed is activated when the good is disjunctively produced.

Another of Yamagishi and Sato's findings involves the different pattern of contributions made by friends vs. strangers in these different conditions. They found that compared with groups of strangers, subjects who belonged to groups which were comprised of friends contributed more to the public good. This aspect of Yamagishi and Sato's study in effect contrasted the behavior of friendship networks with the behavior of social isolates (as far as the experimental groups were concerned). Thus it can be seen that certain types of social networks enhance people's trust of others, which in turn can facilitate cooperative behavior in commons situations. From these results, the authors conclude that the public goods problem may be solved by means of manipulating people's trust in certain situations, but not in other ones. Thus, the applicability of this type of solution depends on whether the context of the situation is likely to activate fear or greed.

Visibility appears to influence trust in commons and other social dilemmas. For instance, whether people's actions are public or anonymous has been found to influence cooperation in simulated commons dilemmas. As Gifford (1987) and others have noted, people are more likely to act in accordance with group interests when they must tell others about their actions. In non-disclosure situations, however, the participants cannot determine what others are doing. In such situations one would expect more self-interested behavior to occur. Employing a game simulation of a commons dilemma, Cass and Edney (1978)

manipulated whether participants could see how each of the others was acting. When participants could see others, two out of three measures of cooperation rose significantly. The work of Bixenstine, Levitt and Wilson (1966), Jerdee and Rosen (1974), and Fox and Guyer (1978) also support the finding that public disclosure increases the number of public interest choices. From a network perspective this finding is not surprising. If people's choices are highly visible, their actions are easily evaluated by others. Other members of the social network can then either respond to the individual's behavior by rewarding or punishing her, or by changing their own behavior.

A seemingly related finding is that people in large groups cooperate less than people in small groups (Rapoport et al., 1962; Bixenstine et al., 1966; and Bonacich et al., 1976). These findings, seem to echo the work of Latane' and Darley (1968, 1970) on the diffusion of responsibility. In many social dilemma situations it may not be clear who is responsible, or if an individual's behavior has a significant impact on a collective outcome (e.g., preventing pollution, helping the poor). This line of reasoning also would seem to overlap with Dawes' limited cognitive processing theory of social dilemmas (which wll be discussed in further detail, later in this this chapter). Dawes (1980) has suggested that one reason for uncooperative behavior may occur in commons situations is people's limited ability to accurately process information, particularly social information.

A number of biosociological theories have been developed to explain resource behavior in terms of territoriality (see Wynne-Edwards, 1962, 1965; Ardey, 1970; van den Berghe, 1974; Wilson, 1975; Dawkins, 1976; Hardin, 1977b). This body of research has its roots in studies on aggression and territoriality in animals, and

focuses on the biological bases that underlie human behavior.[10] A review of this literature is beyond the scope of the task at hand. A number of empirical studies, however, have suggested that amongst humans, dividing the commons into territories holds implications for its management (Edney and Harper, 1978a). In particular, findings from a number of laboratory studies suggest that the creation of territories enhances resource preservation (Edney and Harper, 1978a). In effect, creating territories reduces the size of the network segment exploiting the resource. Results from field work in this area also support this conclusion (see Acheson, 1975; Wilson, 1977). For example, in Acheson (1975) looked at two types of lobster fishing territories to examine the effects of territorialization on resource stocks in the Maine Lobster Fishery. One type of territory consisted of loosely defined territories - almost a commons. The second type consisted of well defended and controlled territories. Lobsters caught in the latter were larger, stock densities were larger, and each lobster fisher in them made about $6,000 more a year. Edney and Harper (1978a) have commented that the studies of Acheson (1975), and Cass (1975)

> ... throw doubt on Hardin's (1968) pronouncement on commons dilemmas, that they have no technical solution: 'it requires a fundamental extension of morality' (p.1248) and Crowe's (1969) opinion that even an extension of morality will not work. (Edney and Harper, 1978:502)

From a network perspective, territorializing commons makes users much more visible. Group members can more easily monitor and discipline fellow users. Thus opportunities for free riding are reduced.

Trust, therefore, appears to be an important mediating variable between territorial division, social network structures, systems of information transmission,

and behavior in commons situations. As the size of a group sharing a resource increases, the anonymity of individuals in the group increases, and trust of others tends to decrease. Further, in such situations, "selfish" behavior may occur in part because the unique impact of one individual's actions on the resource, when contrasted with the actions of all others summed across the group, may not be obvious. In large systems what constitutes cooperative behavior may not always be clear, while individual interests usually are - selfish behavior is easier.

Kadushin (1981) discusses three variables important in accounting for people's actions in N-person exchange networks: trust, cost, and the value of the reward. From his work it can be extrapolated that if levels of trust can be created in a social system intended to prevent the worst outcome of a collective dilemma, then the probability that individuals will enagage in cooperative action should increase, even in the face of relatively high costs. In general, the greater the visibility of the network or circle, the greater the trust in the system. As noted above, the absolute number of members in a social network will affect trust of the system as the action of individuals becomes more or less visible. The structural characteristics of the network should influence patterns of communication which in turn should influence trust in the system.

Cognition

Social Cognition: Attributions in the Commons

There exists a substantial research literature on social cognition, part of which outlines a number of systematic biases that people make while perceiving both the physical and social worlds (see Fiske and Taylor, 1984). For instance, people tend

to simplify complex social information. The short-cuts people use to process such information often result in errors and biases (Tversky and Kahneman, 1974). Research in social cognition has suggested that stimuli that are concrete and proximate tend to be the most vivid (Fiske and Taylor, 1984). Gartrell (1987) has noted that this finding complements the observation that social network contacts provide "cheap, easy, and precise" referents for making social evaluations. In commons situations, people are undoubtedly influenced to some degree by cognitive biases. How people perceive and think about themselves as well as other participants in the commons, has received limited attention to date.

How people make attributions about their social world is a much-studied problem (Fiske and Taylor, 1984). Attribution theories describe people's causal analyses or attributions about the social world (Fiske and Taylor, 1984:10). People often make attributions about someone else's behavior; for example, whether another person's behavior seems to be caused by the external situation or by the person's disposition. The actor-observer effect is an attribution phenomenon refering to the finding that although we see other people's behavior as caused by relatively enduring dispositional factors, we tend to attribute our own behavior to external factors and see it as more variable from situation to situation. This effect has been found to be prevalent when attributions are made comparing members of other social groups with the self (and one's own group), and is probably one of the bases for social prejudice. There are several qualifications, however, to this general finding:

> When either the self or someone involved with the self has committed the action, credit for positive events and denial of blame for negative events is even stronger (S.E. Taylor & Koivumaki, 1976; see Monson & Snyder, 1977). ... Overall, the actor-observer effect is modest in size (L.R. Goldberg, 1981), and ... can be undone or

> reversed depending upon the orientation of the observer or the type of behavior for which attributions are made. (Fiske and Taylor, 1984:79-80).

The tendency to take credit for success and deny responsibility for failure is known as the self-serving attributional bias (see Bradley, 1978; Miller and Ross, 1975; M.L. Snyder et al., 1978); Zuckerman, 1979; Knight and Vallacher, 1981). It is assumed that self-serving biases stem from a need to protect the ego from assault (Snyder et al., 1978; Fiske and Taylor, 1984).

The significance of attributions in the commons, as in other situations, is that how people think of themselves, and others, influences subsequent action. For instance, one study of school children found that children who were repeatedly told they were neat and tidy subsequently littered less than children in other experimental conditions (Miller, Brickman, and Bolen, 1975). In addition to attributions made about his/her self, the ways in which an individual perceives the motives of other actors in a social system, such as the commons, influences subsequent behavior on the part of that individual. The influence of attributions on behavior is a factor that the payoff structure of a given situation - as outlined in economic and gaming approaches, with their emphasis on rational action - does not fully account for, when explaining behavior in commons dilemmas. The perceptions people make about others influences the structure of the situation as they perceive it and thus what constitutes "rational action" for them.

Environmental Cognition

Environmental cognition refers to the processes through which people perceive and think about the physical environment. Perception occurs when an organism becomes aware of external stimuli. Social and cultural factors influence what one learns or what one has the opportunity to experience, and hence probably influences how one learns to perceive the environment. For instance:

> A classic example is the fact that certain cultures emphasize rectangular construction, and others emphasize curvilinear construction or at least less vigor in erecting vertical and rectilinear walls (Allport, 1955; Allport and Pettigrew, 1957; Gregory, 1966; Segall, Campbell, and Herskovits, 1966). As a result, members of cultures with "carpentered environments" see lines on two-dimensional surfaces in a different way than do members of cultures with less carpentered environments. (Bell et al., 1978:37).

Barker (1976) provides a further example of social influences on environmental perception. His work focuses on perceptions of air pollution. Findings from several studies have indicated that socioeconomic levels are related to perception or tolerance of air pollution. It was found that on average, residents of high socioeconomic status who lived in relatively unpolluted suburban areas were less concerned about pollution than were lower socioeconomic level citizens who, in fact, usually lived in closer proximity to sources of pollution. It was observed that those who were most aware of and concerned about air pollution were of higher socioeconomic status and lived in areas with high levels of pollution. Barker explains this finding by arguing that lower socioeconomic groups either are primarily concerned with more immediate problems of day-to-day living or believe that they are helpless to fight the problem of air pollution. It is important to recognize that socioeconomic status implies different network affiliations (Wright et al. 1982; Wright 1982a, 1982b, 1983, 1984). The basis of these different

orientations likely lies in social exchanges that distinguish lower and upper class social networks.

Limited Cognitive Processing Theory

One of the theories that has been put forward to explain commons dilemmas, deals with people's limited ability to cognitively process complex information (Dawes, 1980). Dawes (1980: 189-190) states that:

> The analysis and literature reported thus far support a very simple theoretical proposition, one derived from extensive literature documenting that people have very limited abilities to process information on a conscious level, particularly social information ... such cognitive limitation may often result in an inability to understand or fully grasp the utilities in a social dilemma situation other than those that are most obvious, i.e. those connected with the payoffs. But it is precisely the payoff utilities that lead the players to defect, while the other utilities - e.g. those connected with altruism, norms, and conscience - lead the players to cooperate. It follows that manipulations that enhance the salience and understanding of these utilities should increase cooperation. Communication ..., public disclosure, and moralizing are precisely such manipulations.

Dawes argues that often people may defect from engaging in behavior that is consistent with a collective group or society's interests not out of malicious self-interest, but because of information processing limitations. These cognitive limitations may restrict their "vision" to only those payoffs and/or utilities that are most obvious - which usually mean those which affect them directly, at the present moment. This observation dovetails with the central theme of my thesis - that social networks play an important role in commons dilemmas. Networks structure the flow of information and enhance visibility in such situations.

Dawes' (1980) position is somewhat optimistic and conflicts with that of Hardin. Dawes seems to imply that a technological solution is part of the answer

to the commons dilemma. Through technology, knowledge can be made salient. Knowledge in turn can influence morality and trust - thus enhancing cooperation in commons, social, and other collective dilemma situations. It should be pointed out that network membership influences the information an individual receives about a social/commons dilemma, and probably enhances his/her understanding of such situations.

Freedom and Equality

The distribution of resources in society, especially scarce resources, raises a number of interesting philosophical problems. Two of these pertain to the values' of equality, and freedom.

With regard to commons dilemmas, Edney (1981) has discussed the psychological contradictions involved in the allocation of scarce resources in reward oriented, egalitarian societies such as our own in North America.[11] Equality of opportunity and, to a lesser extent of condition, is a societal ethic that is maintained in North America - if not in practice, at least verbally. Freedom is generally thought of as being a fundamental value in our society. However, equality and freedom are not independent of one another. Because people are not born of inherently equal abilities, or into equal socio-economic circumstances, if there is to be unchecked freedom in society, there will not be equality. On the other hand, if all members of society were "made" equal, they are constrained in their pursuit of freedom; or if all members have their lot enhanced by a higher power such as government, then there cannot logically be freedom. Freedom and equality have to be traded off against one another.

Garrett Hardin (1968) has argued that unconstrained freedom in a commons will lead to eventual disaster. He provides the example of the debate over forced birth control, and the ongoing disaster of overpopulation. Theoretically, the relative strength of people's beliefs in these two concepts, lead to interesting and important potential consequences for behavior in commons dilemma situations. Several authors have suggested that some degree of inequality is necessary if commons are to remain functional (Hardin, 1968; Edney, 1981).[12] It can be argued, however, that if equality of condition is emphasized as a social value by members sharing a commons, competition between members in resource harvesting will be reduced, and resource survival enhanced. On the other hand, if societal members value freedom in a commons, competition between resource harvesters will increase, and severe resource depletion may occur. From these observations, the need arises to empiricially investigate these two values and their relation to resource behavior. Further, possible structural conditions associated with the development of such social values in commons should be explored.

Ideologies and Belief Systems

Resource-relevant social networks are probably involved in some scenarios, in the promotion of belief systems about the power structure, and in the allocation rules relating to shared limited resources. Erickson (1982) has discussed the relations between social network structure, ideologies, and belief systems. In outlining the relations between network structures and attitude formation, she distinguishes between two key concepts: ideologies and belief systems. People in similar structural locations may share similar attitude profiles or ideologies. Alternately, people who are members of a subgroup within a complex social

network may share an attitude space or belief system. An ideology refers to the contents of the attitude cluster, while a belief system refers to the dimensions which organize sets of attitudes and perceptions. Both ideologies and belief systems are said to constrain attitudes. That is, they allow for the predictability of one attitude from another. Erickson calls for more structural research on both the sources and effects of belief systems.

Kadushin (1981) has observed that those with greater power in a system are likely to regard it more highly and to have more faith in it. He argues that often the more powerful members create a sense of obligation and resentment on the part of the less powerful and less well endowed. For both levels of members, ideology is important in perpetuating this process. The issue of power differentials in commons dilemmas is an important one and has not been adequately addressed by social psychologists who have studied commons dilemmas (Edney (1981) has alluded to this issue). With regard to commonly held resources, it can be assumed that those with greater power probably have greater access to the resource. If the resource is a common property of the society, those with less power, who receive less than their "share" of the resource, should experience relative deprivation. However, those with greater power often may use ideology to mask the true structure of resource exploitation.

Guppy (1987) in discussing the importance of family ties in the commercial salmon fishery in B.C., also notes the contradictions between the ideology of the fishery, and the reality of its structure.

> Nepotism is important in this occupational niche, as in many small businesses. The connection of industry participants is obscured by those who rely on imagery of rugged individualism as an ideological gloss for the industry. While individualism has its place, families are fundamental. (Guppy, 1987:175)

> Current changes in the fishing industry should they continue, may escalate the importance of family connections. ... Among young fishers, only 16 per cent reported beginning in the industry as skippers, in contrast to 37 per cent of older fishers. ... this apparent trend may have an increasing importance to connections, especially family connections, necessary for survival in the fleet. Once more the theme of rugged individualism may be obscuring the actual decline of isolated individuals launching successful careers in fishing. (Guppy, 1987:190)

One conclusion that can be drawn from this work is that resource relevant ideologies are propagated in social networks. This conclusion has an important implication for commons dilemmas: one possible strategy for attempting to solve commons dilemmas would be to make use of group processes as a conduit for transmitting information about such dilemmas, and social values, that might help to protect shared limited resources.

Summary

Stillman (1975) observes that in Hardin's (1968) article there are three major assumptions in the commons dilemma paradigm. Stillman asserts that for the tragedy to occur, the following three conditions must be filled:

> (a) The users must be selfish and they must be able to pursue private gain even against the best interests of the community as a whole.
>
> (b) The environment must be limited, and there must be a resource-use pattern in which the rate of exploitation exceeds the natural rate of replenishment of the resource.
>
> (c) The resource must be collectively owned by society (common-property) and freely open to any user (open-access). (Berkes, 1985:199)

If these three conditions are fullfilled, the tragedy becomes inevitable: within the parameters laid down by these assumptions the dilemma cannot be solved, and "the tragedy of the commons" becomes a tautology.

One conclusion that emerges from this review is that possible solutions to the commons problem have to be pursued outside of the assumptions laid down in Hardin's paradigm. For instance, norms and social values can be established which alter a payoff matrix that formerly favored self-interested behavior. Further, fines and sanctions can be enforced to support such prosocial norms and values. Social networks can be exploited to disseminate these values and enforce social norms that encourage conservation.

With regard to the assumption of common property, territorializing a resource often involves privatizing it. In such cases, this assumption is contradicted and has real consequences. For instance, such a strategy minimizes competition. Territory holders are not required to sustain one another, and the balance of the whole is tipped less by the actions of any one individual (Edney, 1980). Thus, opportunities for free riding on the system as a whole, are reduced.

The commons dilemma has been studied by social psychologists through gaming approaches, largely in a variable analysis fashion (e.g., examining group size, communication, age, territories, visibility). This has left the paradigm relatively devoid of well-developed theory, and has led researchers to exclude complementary aspects of the problem, such as social structure.

Social psychological research on the commons problem lacks an integrative theory. The theories that have been proposed, have tended to focus on either the micro-level (e.g., social trap, limited cognitive processing, equity theory, game theory) or on the macro-level (e.g., tragic choice theory). I suggest that a social network approach might serve as a bridge for linking theory and research on micro behavior to macro social structural considerations.

Notes

1 The substantive area with which Chapter 3 is concerned.

2 Game theory can viewed as a branch of decision theory in which there are two or more decision makers, typically with conflicting interests. Rapoport and Orwant (1962) state that the aim of game theory is to prescribe decision policies appropriate to such situations, formalized as games, in such a way that the policies are seen as necsessary, logical conclusions derived from certain assumptions of rationality and from the constraints of the situation. They argue that game theory is normative, rather than descriptive: its conclusions state how 'rational' people ought to behave, rather than how real people do behave.

One of the "fathers" of contemporary game theory was von Neumann (1964). His ideas were most influential in economics, although they have also had an impact on psychology and sociology. Many of his ideas, are applicable to commons dilemma research especially his discussion of short term tactics vs. long term strategies.

3 The payoff structure in commons dilemmas can consist of material, social, and psychological payoffs. Material payoffs refer to the material benefits a person receives, minus the material costs he or she incurs. For example, in resource harvesting such costs would include licenses, transportation, harvesting equipment, fines, and so on. Generally, material payoffs can be viewed in economic terms - as the value of the resource that the harvester will receive from selling, or trading, the resource, or in some cases using the resource himself/herself (e.g., fish, trees, etc.). Sanctions and fines can be considered as negative components in calculating material payoffs. For instance, the material payoff for a factory owner would be the profits received from goods

manufactured by the factory minus any fines for air, or water pollution received by the factory from a governmental organization (such as the Environmental Protection Agency in the United States). The structure of the payoff matrix, the balance between these material costs and benefits, is a very important predictor of behavior. Social values or utilities as they are sometimes called, can, however, significantly modify the relation between the payoff matrix and resource relevant behavior.

External social payoffs are the social costs and benefits associated with given resource behaviors. Prudent resource behavior, and "altruistic" resource acts may elicit praise, while resource abuse, denigration, and overly selfish behavior may lead to social sanctions in addition to material ones. Research has shown that fear of sanctions and/or punishment can affect the payoff matrix, and subsequently behavior in social/commons dilemma situations. For instance, in game simulations of social dilemmas (Caldwell, 1976) it has been found that cooperation is higher when participants are given the opportunity to punish those who act in self interest. Social networks provide the context in which such social rewards and punishments are dispensed.

Internal psychological payoffs refer to the internal rewards or punishments people experience as a result of their resource behavior that are not directly linked to external material or social rewards. These include such experiences as pride in the state of a resource one has helped to preserve, an increase in self-esteem as the result of contributing to resource preservation, and guilt from failing to act in accordance with good resource management strategies. In particular, empathy for the plight of others is probably a key component of such internal psychological payoffs. For instance, one motive for acting to preserve

the environment is empathy for future generations. Internal psychological payoffs are probably implicated in altruistic behaviors. In discussing "internal psychological payoffs" I employ a broad definition of the term "altruism"; one where people may act to benefit others at some cost to themselves, without the expectation of receiving any external material, or social recompense (or conversely, without the expectation of avoiding social penalties for their actions). This definition differs from some others in that it does not require that an individual engaging in an altruistic act be doing so without any expectation of reward (or self interest), just that, they not be expecting any "external" reward.

Sorokin (1953) has elaborated the need for social scientists to examine altruism - as a necessity for the survival of humanity.

> '...the fission-forces' of altruistic love are so gigantic and so sublimely rich that a better knowledge of these potentials is the noblest and the most powerful force humanity can have for its self-control and for a gigantic renaissance of its creative forces in the field of truth, beauty, and goodness. The time has come when an infintely intensified study of the sublime "energy of love" should be on the agenda of history. If we acquire a deeper knowledge of its 'fission-forces' and put them into operation, all will be well with mankind. If we fail, hate with its satellites - death, destruction, misery, and anarchy - will continue to blot human history and perhaps end it in mad destruction. (Sorokin, 1950: 213)

4 Berk describes decision theory (Raiffa, 1970; Chernoff and Moses, 1959; Luce, 1964) as a prescriptive strategy for maximizing one's rewards and/or minimizing costs in a given situation. This description guides his approach to crowd behavior. He cites Raiffa's list of five steps which should precede an act: 1) list the viable options available to you for gathering information, for experimentation, and for action; 2) list the events that may possibly occur; 3) arrange in chronological order the information you may acquire and the choices

you may make as time goes on; 4) decide how well you like the consquences that result from the various courses of action open to you; 5) judge what the chances are that any particular uncertain event will occur (Raiffa, 1970: x).

5 For instance, participation in the simulation, to be discussed later, was required as part of a laboratory assignment for university undergraduates enroled in a social psychology course at the University of Victoria. People participated in the simulation and were then required to hand in a written assignment based on their experiences. The subjects' accounts of their feelings and behavior during the game suggest that they found the simulation to be highly engaging. Their descriptions seem similar to those that could plausibly occur in naturalistic settings. For example:

> In our group, we established a maximum of two fish, but there was always the possibility that someone would take more. Also in our group, in session two, we got a little bit mixed up, and I took three at one time. This created a lot of hostility with the other two in the room, even though I tried to explain to them why.
>
> I know from my own feelings at first, in the first session, I did not quite understand and know how the others would act, but by the second session we were talking about the ideal amount so that we would all profit equally. But as we continued I noticed more fish being taken out than we agreed on and I knew it was not myself so the next turn I took one less fish in order to make up for someone else being selfish. That was a stupid move though, because the next time they took two more then they were supposed to. When this happened I felt angry that they were being stingy and that they were not being fair, the other person also felt the same as I did. We told her that she better stop it, because she would wipe out the stock of fish and that she was not being fair and we made her not take anything on one turn to make up for the extra one she took. Had we not been able to communicate we would not have been able to find out who was taking the extra fish and we would not have been able to face her.
>
> Why would subjects choose to take more in the second session than in the first? I know that this happened in my group, and I have to admit that I was absolutely flabbergasted! We were in the communication condition and had been going along smoothly (and

> rather uneventfully), when Whammo!! all of a sudden our supply was in danger of extinction. We looked at each other accusingly, and I was pretty mad - the two others in my group were people I trust and have known since grade eight! One of them was being greedy, and it really infuriated me. The next round two of us tried to compensate by only taking a couple of fish, but the other one kept fishing away. When it became clear when the scores were flashed at the end of the session which one of us was not following the rules that we had each agreed upon I couldn't help but ask her "Why?" She said that she just "felt like it", (taking extra), and didn't feel she owed us any more of an explanation. I guess you really don't know someone until you go electronic fishing with them.

6 Bailey (1982:330) notes that:

> Simulations and games are assuming increasing importance in social sciences (mostly since the 1950's), both as heuristic (learning) and as data-gathering devices. Simulations and games are a special kind of model. A model is a representation of a system that specifies not only its parts or components (generally variable in social-science models) but also the relationship among the components. That is, the model demonstrates the structure of the system. A model is a copy, replica, or analogy that differs from the real thing in some way. This difference may be only in size ... Other models may be full sized but may not be complete in every detail, including only those features of the real thing that are necessary for the modeler's purpose. ... the goal in social-science models is not necessarily to include all features of the system being modeled, but only those necessary for the research purpose.

A distinction is generally made between "games" and "simulations". In some literatures, "games" refer to experiments in which people participate in some type of game that is structured to resemble a real life scenario. The term, simulation, is often used to refer to experiments involving no human participants, in which a computer program is devised to model the processes and possible outcomes of a real life scenario. In much of the social/commons dilemma research and the laboratory research to be described, the distinction between games and simulations does not necessarily hold. In many of these studies, people participate with others and a computer in game-simulations.

That is, experiments in which people participate in a game structured to resemble a real life situation, and which employs the use of a computer to model processes of the of the scenario, and calculate outcomes based on the subjects' behavior. Many games have been developed within the social sciences for research and teaching purposes, most within the last 25 years. These games have been developed in several different social science disciplines (sociology, political science, education, psychology, business administration). They vary widely in terms of complexity and the number of participants required (Bailey, 1984).

A distinction is often made between zero-sum and non-zero sum games. In zero-sum games there is a single fixed or constant reward that cannot be increased or decreased during the course of the game, and therefore must be divided up among the respective players. This means that one player can gain only to the detriment of other players. The optimum strategy for each player is to maximize his or her reward, thus making the game purely a competitive one.

In contrast to zero-sum games, the amount of reward in nonzero-sum games is variable. In a nonzero-sum game the competitive strategy is not necessarily the optimum strategy for a given player. Allowing one's opponent to gain does not necessarily mean that one will lose, and the optimum strategy for all players may be to cooperate, thus maximizing the gain to each. Nonzero-sum games are also called mixed motive games because a player's motive may be either competition or cooperation.

7 In conducting his field study, Gartrell worked with, observed, and interviewed blue-collar workers in a municipal public works department. Workers were asked: how their pay compared with pay for jobs outside of the department of

public works (DPW); about wage rates in other departments (in the same municipality), in other cities' DPWs, and with professional salaries; about the wages paid to other positions within the DPW; about changes in pay differences between their own and other positions in the DPW since they began working there; and how what they had to do in their jobs compared with what others in the same position had to do elsewhere in the DPW. Further, workers were asked how they had heard about the referents they mentioned

8 Hyman and Singer (1968) state that:

> If the groups to which individuals refer themselves, their reference groups, are empirically determined, knowledge and predictions of attitudes, self-evaluation, and conduct will be enhanced; the cherished principles about group influences can be protected; and an understanding of the complex processes by which men relate themselves to groups can be enriched. Such is the hope of reference group theory and research, and the basis of its attractiveness to social scientists. (Hyman and Singer, 1968:4-5)

9 Bonacich, P. "Communication Networks and Social Dilemmas." Presentation given at the West Coast Conference for Small Group Research, 1987 Meeting, April 17, at the University of California at Los Angeles.

10 Biosociological theories also hold implications for other issues in the commons dilemma, such as altruism (see Hamilton, 1963; Trivers, 1971; Wilson, 1975; Stein, 1985; Brown, 1986) and social inequality (see van den Berghe, 1974; Ogmundson, 1986).

11 Social class is a structural variable that probably plays an important role with regard to inequality in commons dilemmas. Social class will be explored in Chapter 4.

12 It should be noted that commentators on this problem have not clearly specificed whether they mean (in)equality of condition or (in)equality of opportunity.

Chapter 3

STUDY 1: A FIELD SURVEY STUDY OF PACIFIC SALMON FISHERS

This chapter reports the results of a study of resource harvesters in a real world commons - participants in the B.C. salmon fishery. Background to the study will be provided, initially, through a discussion of how the B.C. salmon fishery has developed into a commons dilemma. The findings of a field-survey of commercial salmon trollers and sport fishers conducted during the summer of 1985 will then be presented. Finally, the chapter will explore suggestions relating to how social networks influence cognition and behavior in the context of the fishery commons.

Background

The Context of the B.C. Salmon Fishery

The salmon fishery[1] is of considerable importance to the province of British Columbia, and to the Greater Victoria Area in particular. The fishery is one of B.C.'s major industries; it acts as a "lure" for tourism; the salmon is of substantial cultural significance for some groups (e.g., Native Indians); and finally, the salmon fishery has become an important recreational pastime for many local British Columbians.

In order to understand how the fishery became a commons dilemma, it is necesary to outline some of the sources of conflict which have led to resource depletion. Additionally, this material is presented in order to illustrate the significance of the fishery to the region.[2]

Ecology and Political Jurisdiction of the Fishery

The federal government of Canada manages and regulates the public or common-property fisheries: all stock in a wild state (as opposed to cultured) in tidal waters. All of the major commercial fisheries fall in this category. The provincial government has jurisdiction over the processing and sale of tidal fish once they are caught, as well as control of the non-tidal fisheries (except salmon).

The geography of the British Columbia coastline is particularly well suited to salmon, as there are several river systems for spawning and large areas of sheltered water for the feeding of smolts. The quality of the sheltered bays and inlets, estuaries and foreshore is crucial to the survival and development of salmon in their early stages of life as well as to other stocks, such as herring and shellfish. Many of these areas, however, also support the major concentrations of settlement in the province as well as port facilities and industrial development. The two major ports in B.C. are Vancouver and Prince Rupert. Vancouver is located on the province's most important estuary, that of the Fraser River. Thus, there is an environmental conflict between the large population centres with their sewage, port and industrial pollution, and the protection of marine stocks which require a clean habitat.

The province's largest industry, logging also generates conflict with the fisheries. The forest maintains the fresh water systems used by salmon, and

certain logging practices such as clearcutting unstable slopes can lead to slides and siltation of gravel spawning beds, which can have a detrimental effect on the fishery. Salmon stocks are extremely sensitive to disruption of their fresh water habitat during the spawning, egg and fry stages of their life cycle. The environmental conflict is further exacerbated by the fact that these different industries fall under different governmental jurisdictions.

There are five species of Pacific salmon: sockeye, pink, coho, chum, and chinook. All stocks are depressed, to varying degrees, and the decline in chinook stocks has been so alarming as that severe fishing restrictions have been imposed in recent years. The federal Department of Fisheries and Oceans in its 1984 Commercial Fishing Guide listed sockeye and pink salmon as the only two species capable of supporting the industry over the next few years.

The Commercial Fishery

In 1982, Canada was the leading world exporter in dollar value of fish products.[3] Salmon is the most important fishery in B.C., in terms of both landed weight and value. In 1982, salmon comprised 71% of all B.C. fish landings, for a market value of $315 million (Canada, 1983).

The salmon fishing season usually runs from mid-April until well into the Fall, peaking in July, August, and September as the fish congregate in the inshore waters prior to spawning. In 1982 there were 7,536 commercial fish boats licensed in B.C. (Canada, 1983). Most of the fleet is owned by individual vessel owners although some companies own several vessels each and the larger processing companies have, in the past, also maintained fleets. Fishing vessels are licensed according to the type of fish caught and gear used, and a given boat may have

more than one type of license. Salmon vessels use trolling gear, gillnets, and purse seines. In 1982, trollers took 32% of the total salmon catch, gill-netters 27%, and seiners 41% (Canada, 1983).

In 1982 there were 17,312 commercial fishing licenses in existence.[4] There are numerous unions, associations and cooperatives representing the interests of vessel owners and crew members. The largest of these, the United Fishermen and Allied Workers Union, had between 6,000 and 7,000 members. At the time of my study, Native Indian participation in the industry was significant. In 1980, Indians owned or operated an estimated 15% of the licensed salmon fleet (Pearse, 1982). There is a very high degree of corporate concentration in the fish processing industry. In 1979, more than half of all salmon caught in B.C. were processed by the three largest companies.[5]

The Pearse Commission

On January 12, 1982, the Commission on Pacific Fisheries Policy, headed by Peter H. Pearse, was appointed by the Governor General in Council of Canada. Its terms of reference instructed the Commisioner to investigate, and to make recommendations, regarding most of the major issues of governmental policy relating to Canada's Pacific fisheries, with the exception of international arrangements. In the Commision's Final Report, Pearse (1982) outlined his analysis that the central economic problem of the commercial fisheries was "the chronic overcapacity of the fleet". He argued that the tendency for fishing fleets to overexpand is rooted in the way the commercial fisheries have traditionally been organized.[6]

Economic and political criticisms have been levelled against the Pearse Commission's analysis of the Pacific fishery. A full discussion of these, however, is beyond the scope of the task at hand (for a review see Marchak, et al., 1987).

The Sport Fishery

Sport salmon fishing attracts sport fishers from many parts of the world, and is an important recreational activity for hundreds of thousands of Canadians. Curiously, although a provincial freshwater sportfishing licence had been in place for many years, tidal water anglers were not licensed until 1981. In 1981, it was estimated that the total number of anglers was about 320,000. It was further estimated that 90 percent of the total salmon sport catch took place in the Strait of Georgia. Sport fishers accounted for about 21 percent of the total chinook catch and about 15 percent of coho. Taking all species of salmon together, sport fishers accounted for about 4 per cent of the total harvest (Pearse, 1982). In 1980 it was estimated that the coastwide angler-owned pleasure boat fleet was worth $837 million. At this time, spending related to saltwater sportfishing on the Pacific coast was approaching $100 million annually. A substantial proportion of this figure was spent on local goods and services and, in addition, many of the boats, tackle, and other supplies were manufactured locally. Furthermore, accomodation, food, boat services and so on were supplied locally (Pearse, 1982).

The Greater Victoria Area

In 1979, it was estimated that the total income derived from fisheries in Greater Victoria for 1977-1978 was $39 million.[7] The local commercial fishing fleet consisted of 521 licensed vessels, equivalent to 8% of the entire British Columbia

fleet. Of these, 307 were salmon trollers (15% of the B.C. fleet). There were also small numbers of salmon gillnetters (54), salmon seiners (9), draggers (7), and longliners (8). In 1977, 1,107 residents of Greater Victoria were licensed to engage in commercial fishing and earned all or part of their income from it.[8]

In 1978 approximately 19% of the Greater Victoria population, or more than 45,000 persons, participated in saltwater angling, freshwater angling, or both. This is equal to 9.8% of all sport fishers in British Columbia. Approximately 21% the of total angling effort in the province and 21.4% of the province's sport salmon catch occurred in the Greater Victoria area; the number of recorded angling days was second only to the Comox-Courtney area. In addition more than 10,000 visitors to the area from other Canadian provinces and other countries, reportedly participate each year in sport fishing locally during their visit (Westen, 1979). In 1978 sport fishers spent more than $22 million for food, lodging, transportation, fishing gear, fishing services and other direct goods and services. An estimated 73% or $16.3 million of this amount was spent in the Greater Victoria Area.[9] It would be reasonable to assume that these figures have changed somewhat since 1979, in light of recent recessions. However, the importance of the fishery to the region in economic terms is considerable.

There have been ongoing disputes between different fishing groups as to the direction fisheries policy should take. Many cities on Vancouver Island, such as Port Alberni and Campbell River, would like the Department of Fisheries and Oceans to emphasize the rights and needs of sport fishing - as sport fishers, particularly visitors, bring in a great deal of money to a number of sectors in the community. There have been ongoing disputes not only between commercial

fishing groups and sport fishing associations over government policy, but also between different groups of commercial fishers such as trollers, seiners, and gillnetters. Finally, there have been disagreements between different fishing groups over policies protecting traditional Native fishing rights.[10]

Summary

In summary, salmon stocks in B.C. are dwindling, yet economic pressures have been mounting on commercial fishers, as well as on those who benefit from sport fishing. The Pacific salmon fishery, up to the present day, has been characterized by conflict between both different fishing interests and various levels of government, as well as ad hoc policy making on the part of the federal government. The Pearse Royal Commision Report (1982) was a much needed first step in attempting to alleviate this situation.

Social Science Fisheries Research

In 1984, the Canadian Minister of Fisheries and Oceans, Pierre de Bane remarked that the Pacific salmon fleet had the capacity to catch the entire year's harvest in one day (Lyon, 1984). Such a comment brings into sharp focus the staggering possibility of resource extinction, and underscores why resource management should be a topic of immediate concern in this area.

Until the mid 1970's, the fisheries, as well as other natural resource areas, had suffered from a lack of social science research other than that done by economists. A slim publication echoing these very concerns was produced for Fisheries and Environment Canada by Andersen (1978). Since the mid 1970's, however, anthropologists have been examining the interactions between the

culture, and social organization of relatively small, traditional communities, resource management practices, and resultant ecological effects. (For a review of this literature as it pertains to fishers in particular, see Berkes, 1985. See also, McCay and Acheson, 1987.)

A second line of social scientific inquiry into the problems of fisheries in particular, has come from political economists (see Marchak, 1984; Marchak et al., 1987). A recent issue of the Journal of Canadian Studies (1984, No. 1) was devoted to social structural aspects of both the Atlantic and Pacific coastal fisheries.

The problem of the commons, and of common property fisheries in particular, continues to lack an adequate social psychological analysis. While it has been asserted that cognition mediates between social structures and resource behavior, this issue has largely been overlooked in social scientific research on the commons problem, especially in those studies which have been conducted in naturalistic settings.

When examining the Pacific coast salmon fishery commons from a macro level perspective, an argument can be made that the fishery exists in the context of a "pluralist political system"; that is, a system in which a variety of groups or factions influence policy in such a way that no single number of groups can control it, or, conversely, in which all legitimate interest groups have an appreciable share of influence (Huber and Form, 1973: 132). Some neo-Marxist approaches, however, would explain the fishery in terms of its inherent class relations. Some have argued, in fact, that the primary causal force in the fishery is banking capital - and that this influence extends to federal government policy (see

McMullan, 1984). Although this debate has its merits, the present focus is concerned with a micro-level analysis of the fishery.

As my review has already shown, a great deal of empirical work has been done by social psychologists studying experimental "game" simulations of social, and commons dilemmas. Many of these games have been structured so that the payoffs of the game resemble those of real life social dilemmas. At present there is a lack of evidence to support or refute the validity of game simulation approaches (Gifford, 1987).

The Pacific Salmon Fishery As A Commons Dilemma

Berkes (1985) discusses fisheries in the context of the commons dilemma paradigm. He notes that examining this substantive area is most appropriate because the common-property resource theory was initially formulated for the fisheries (Gordon, 1954).

Berkes has tested these assumptions of the commons dilemma paradigm against empirical case-studies, in order to determine the conditions under which the tragedy occurs, and to explore the role of community-level resource management and self-regulation within the larger framework of resource management policy. He notes,

> It is clear that many small scale, traditional or otherwise community - based fishing operations violate one or more of the preconditions of Hardin's (1968) commons paradigm. Yet examples of resource collapse are found not only in open-ocean fisheries. Over-fishing is common also in inshore areas, and in lakes and rivers fished by communities. Self regulation, where it occurs, is vulnerable to a number of stresses. These include (1) the loss of community control over the resource, (2) commercialization, (3) rapid population-growth, and (4) rapid technological change (Berkes, 1985:202).

How does the Pacific salmon fishery meet the three assumptions necessary for the "tragedy of the commons" to occur? In the case of the Pacific salmon fishery, the validity of these assumptions is partly supported and partly unknown: 1) whether the users are selfish or not is an empirical question, and a matter of degree, as is the ability of users to pursue private gain even against the best interests of the community as a whole; 2) based on statistics which describe salmon stocks as being seriously depleted, and the comments about the harvesting capacity of the Pacific salmon fleet by officials who have access to the best available scientific knowledge, there is little question that the resource is limited, and there is a resource-use pattern in which exploitation exceeds the natural rate of its replenishment; 3) the resource is collectively owned by society. Although access is not free, it is relatively open, especially to sport fishers. In sum, there is no evidence that the characteristics of the Pacific salmon fishery seriously violate the paradigm's assumptions.

As we have seen, the bulk of social psychological research into commons and other social dilemmas has been carried out within a game theory framework. At an individual level, the Pacific salmon fishery can be described in terms of game theory as follows. In the Canadian Westcoast commercial salmon fishery, catch limits are not allotted to individuals on the basis of individual quotas, as is the case for some fisheries. Rather, the entire salmon fishery is closely monitored by government biologists, the amount of time neccessary to catch a certain number of fish with a certain type of gear in a given area is estimated by these fishery biologists, and then an opening is declared by the Department of Fisheries and Oceans for a certain period of time, in a particular region, for specific types of

fishing vessels. Thus for an individual in the Pacific salmon fishery, the dilemma is whether or not to follow the regulations - i.e.: whether to fish only during specified times, in certain indicated areas, using authorized gear, and for certain species and sizes of fish. To disregard the regulations, as long as an individual is not caught by fisheries officers, is in the individual's advantage regardless of what other fishers do. Although there are stiff penalties for breaking the regulations, the likelihood of being caught is relatively low. However, if all fishers break the regulations, the harm done to salmon stocks could be enormous, and all fishers would be worse off in the long run.[11] From a social psychological perspective we can ask which social and cognitive variables are involved in determining whether or not individuals will follow the fishing regulations.

The Research/Analysis Strategy

The purpose of the field study was to move from the laboratory to a natural setting, to examine a real world commons dilemma. The study was based on previous laboratory research (e.g., see Dawes, 1980), and on research questions derived from previous theoretical discussions about the nature of commons dilemmas (e.g., see Edney, 1981), applied to a naturalistic setting.

A number of variables of interest were selected in developing questionnaire items (e.g., communication, trust, territories, visibility, understanding of the dilemma, resource perception, attitudes, etc.). These will be discussed below.

Analysis of the data has been organized around the general question: How do social networks influence individuals' cognitions and behavior in a commons situation? The effects of group influences on cognition and behavior in commons dilemmas have received limited attention in the experimental literature. Some

work has been done examining the manipulation of group size (Komorita and Lapworth, 1982) and experimentally induced group identity (Brewer and Kramer, 1986). Some research (Acheson, 1975) has examined how the creation of different types of territories in a commons influences group outcomes. At the time the present research was undertaken, however, no field research had been conducted exploring the social psychological correlates of group membership. This despite the fact that there are are a number of obvious and important interest groups in the fishery.

The experimental literature has suggested that formation of a strong group identity on the part of participants in the commons will lead to cooperative behavior and hence "efficient resource behavior" (see Brewer and Kramer, 1986). One purpose of the present analysis was to explore the social psychological correlates of group membership from data collected in a real world situation.

Variables and Hypotheses

A number of variables of interest were selected in developing questionnaire items, based on the commons/social dilemma, social psychological literatures, and on the Pearse Commission Report. These will be discussed below. The research strategy was to collect data on variables that have been studied in laboratory situations, such as communication, and others which have been alluded to in the literature such as freedom, in a real world commons situation.

The main thrust of the present analysis will be to examine the effects of social networks on interpersonal processes and cognitions in the salmon fishery commons. I have defined social network membership by whether or not a fisher

belongs to a fishery-relevant association. In so doing, I assume that the association fosters social ties among its members that are noticeably absent among those who do not belong to the association. Admittedly, association membership is a rough measure of a social network. It does not provide information about an individual's relative structural location, or about the nature and strength of his/her social ties to other network members. It should be satisfactory, however, for contrasting the gross effects of network membership on the cognitive and interpersonal variables that will be examined.

It was hypothesized that due to network influences on interpersonal behavior (e.g., communication, social pressure) and cognitions, people who are members of a fishery-related social network would be more "conservation oriented" in their evaluations, cognitions, attitudes and behavior than would non-members. Secondly, it was hypothesized that due to group influences, commercial salmon trollers would differ from sport salmon fishers in their evaluations, cognitions, attitudes and behavior towards both the resource and other fishery participants. Other relationships are examined in an exploratory fashion.

Network Membership

The questionnaires distributed to commercial and sport fishers can be viewed in Appendices A and B, respectively. Both commercial and sport fishers were asked if they belonged to an association and, if so, which one. (Commercial fishers were also asked what type of gear they used.) This questionnaire item was used to measure social network membership.

Networks and Interpersonal Processes

Communication has been found to be extremely important in eliciting cooperation in laboratory commons (Dawes et al., 1977). The present study sought to explore communication in the commons. Respondents from both groups were asked: how much they communicated[12] with other fishers in general, how much they communicated with fishers about fishing, and how much they communicated with other fishers about Fisheries policy. It was hypothesized that people who were association members would communicate more than non-members. It was also hypothesized that commercial fishers would communicate with other fishers more than sport fishers.

Through increased communication with other fishers, network members should be more highly aware of societal pressure to conserve salmon stocks. Respondents from both groups of fishers were asked how much pressure they felt to cooperate from the government, and from society. It was hypothesized that compared with non-members, association members would feel more pressure from society to follow the regulations.

Networks and Cognitions

Being a member of a social network provides an individual with contacts, with whom to discuss resource management issues. Communication between network members makes individuals more highly visible. The more visible participants are in a resource commons, the more likely it is that they will act to preserve the resource (Bonacich et al., 1976; Cass and Edney, 1978). Increased communication and interpersonal visibility should also lead to increased trust of others. Trust that other participants will act responsibly, has been noted by a number of authors as

being a very important contextual psychological variable related to cooperation rates in commons and other social dilemmas (e.g. Edney, 1980; Yamagishi and Sato, 1986). A series of items were included in the questionnaire to measure these variables. One's feelings/perceptions of anonymity is a psychological component of visibility. Commercial fishers were asked how anonymous they felt about the number of fish they took, and whether they thought others (including the Fisheries Dept.) knew approximately how many fish they catch and sell. It was hypothesized that compared with non-members, association members would feel less anonymous. Several other questionnaire items were also included in the questionnaire to explore visibility. Respondents were asked if they personally knew of other fishers who do not always comply with the regulations. They were also asked to estimate the percentage of other fishers who followed the regulations. To explore fisher's perceptions about the threat of fines, respondents from both groups were asked to estimate the percentage chance of being caught if they broke the regulations. Commercial and sport fishers were asked how much they trusted other fishers with regard to the information they gave about fishing, and about how much they trusted the Department of Fisheries and Oceans with regard to the informaton they gave about fishing. It was hypothesized that association members would report greater trust in other fishers, and the D.F.O. than would non-members. It was conjectured that the more trust fishers had in others the more truthful they would be to others, and the more likely they would be to believe other fishers. To explore this issue, respondents from both categories of fishers were asked if they told the truth to other fishers about how many fish they took, and whether they thought other fishers told the truth. It was hypothesized

that association members would be more likely to report telling the truth, and to believe that others were truthful.

The environment is perceived via a number of channels. It is perceived directly through the cognitive processing of sensations. Further, cultural and social influences effect environmental perceptions. As noted earlier, the existence of a social network facilitates information exchange amongst its members. Network membership should enhance individuals' awareness of environmental problems such as resource depletion and pollution. The present study sought to examine fishers' perceptions about salmon stocks and the fishery habitat. Respondents from both categories of fishers were asked to rate the environmental quality of B.C.'s rivers and streams, to rate the environmental quality of B.C.'s coastal waters, and about their perception of the state of salmon stocks. It was hypothesized that compared to non-members, association members would rate B.C.'s rivers and streams, and coastal waters as relatively more polluted. It was further hypothesized that association members would perceive salmon stocks to be more depleted.

The present study placed an emphasis on examining cognitive factors in the commons dilemma, as these have been somewhat overlooked in past research. Much of the past research on commons dilemmas has been based on the assumption that humans are rational actors. One problem with this approach, is that people do not always have access to perfect information about resource dynamics. Further, people are not perfect processors of information. There are a number of systematic biases people make when perceiving both the physical and social world (see Fiske and Taylor, 1984). One impetus of the present study was

to examine social cognition in a real world situation. To explore the nature of the attributions made by people in the commons, commercial fishers were asked to make attributions (internal versus external) about the behavior of Canadian commercial and foreign fishers.

The present study sought to explore people's attitudes and social values in the context of the commons. Network structures influence social comparison processes, which play an important role in attitude formation and change (Erickson, 1982). In the present analysis, it was conjectured that fishers' attitudes about fishery issues would be influenced by network membership. A number of questionnaire items were included that were designed to measure attitudes and social values concerning fishery issues. Both sport and commercial fishers were asked how harmful to the salmon stocks they thought taking a small catch of salmon illegally would be, and how guilty they would feel if they significantly broke the fishing regulations. Respondents from both groups of fishers were asked whether there should be a limit on the number of salmon one can take, whether there should be limited entry in obtaining a commerical salmon fishing license, and whether catch limits should be stringently enforced or voluntarily enforced. In addition to enhancing information exchange among individual fishers, network effects should also lead members to hold attitudes which reflect a greater concern for preserving salmon stocks. Thus, it was hypothesized that compared to non-members, association members would be more likely to perceive taking a small catch of salmon illegally to be harmful, to perceive they would feel guilty if they broke the regulations, to feel there should be a limit on the number of salmon one can take, and to feel that catch limits should be stringently enforced.

Commercial fishers were asked whether fishers should be free to catch as many fish as they can, or if the fishery should be regulated so as to ensure relatively equal catches. Due to (the postulated) facilitation of egalitarian values, and cooperation fostered during social interaction with other group members, it was hypothesized that people who were association members would more strongly value equality than non-members.

The theoretical relationship between different political systems and resource preservation in commons has been alluded to by several authors (e.g., Hardin, 1978, Edney, 1981). Correspondingly, the question of how socio-political attitudes are related to resource behavior is seemingly of some interest and relevance, to an examination of cognitive factors implicated in commons. Therefore, the present study attempted to determine if there was any link between socio-political attitudes and other variables relevant to resource behavior. Both groups of fishers were asked to rate their socio-political attitudes. It was hypothesized that because of increased independence demonstrated by lack of association, non-members would more strongly favor free enterprise over socialism relative to association members.

There is a lack of data from past research pertaining to perceptions about distributive justice in real world commons. From a social psychological standpoint, questions about distributive justice are of considerable importance to understanding people's cognitions and behavior in commons dilemmas. Of particular interest to the present analysis is the question of how perceptions about distributive justice are influenced by network membership. Due to the nature of the Pacific salmon fishery - which is characterized by intense conflict between

different group interests - a number of questionnaire items were included which asked respondents to make evaluations about group and individual justice considerations. Although these questions were not included specifically to test aspects of distributive justice and other social evaluation theories (but rather, were based on the characteristics of the fishery), these issues are central to the general study of social comparison and distributive justice. Also, some evaluation questions were included to examine people's perceptions about fishery policy.

Conflict between competing fishing interests is a perennial issue in the Pacific salmon fishery. Accusations of favoritism on the part of the federal government are heard from time to time from all fishing groups. To further explore this problem, respondents from both categories of fishers (commercial versus sport) were asked if they thought there was undue favoritism towards certain fishing groups by the Department of Fisheries and Oceans, and if yes - which groups. Another perennial cry heard from Canadian fishery participants is that salmon stocks, and consequently fishers' way of life, are threatened by foreign fishing fleets. To explore this issue, both commercial and sport fishers were asked how much harm they thought foreign fishing fleets do to the stocks of B.C. salmon. Just prior to the study, a salmon fishing treaty was signed between the governments of Canada and the United States. To explore fishery participants perceptions about this treaty, commercial fishers were asked how fair to Canadian salmon fishers they thought the recent salmon fishing treaty signed by Canada and the United States, was.

One questionnaire item asked fishers to evaluate their successfulness. Being a member of a fishery relevant social network probably enhances the individual

fisher's success. Networks enhance members opportunities to make comparisons about fishing gear and techniques. They can discuss strategies such as where to fish. Fishers can chase salmon runs by keeping in contact with one another using C.B. radios to find out where fish are running. Additionally, network membership provides individuals with social reference points with whom to makes comparisons and evaluate their own successfulness. It was hypothesized that compared with non-members, association members would evaluate themselves as relatively more successful.

Satisfaction is a concept related to success. To further explore this dimension of self-evaluation, commercial fishers were asked how satisfied they were with fishing as an occupation, and sport fishers were asked how satisfied they were with fishing as a recreational pastime. Commercial fishers were asked how satisfied they were with fishing as an occupation. In correspondence with the hypothesis regarding success, it was predicted that compared with non-members, association members would be more satisfied with fishing as an occupation/recreational pastime.

Fishery participants are often highly critical of the federal government. To explore perceptions about government policy and performance, several evaluation questions relating to these issues were asked. Networks facilitate the exchange of information and opinions between members. Evaluations about government policy are probably influenced to a substantial degree by comparisons with other network members. Further, network members' evaluations about government policy and performance concerning the salmon fishery, are probably shaped to some extent by association officials who act as "opinion leaders" (Coleman et al., 1966; Gartrell,

1987). Both sport and commercial fishers were asked how much pressure they felt from the government to cooperate and follow the regulations. It was conjectured that pressure from the government concerning conservation measures is directed towards association officials, and then diffused amongst other network members. Thus it was hypothesized that compared with non-members, association members would feel more pressure to conform to the regulations. Other questions that were designed to tap evaluations of government performance and policy, included the following: respondents from both groups of fishers were asked to rate the quality of information they received from the Fisheries Department; the effectiveness of government policy; whether government policy increases or decreases conflict; and how fisheries policy could decrease competitiveness between different fishing groups. Commercial fishers were also asked whether the government should attempt to decrease competitiveness between individual fishers. One goal of the organization that sponsored the research was to record fishery participants' perceptions of "the issues of the fishery", and fishers evaluations of government policy. To this end, respondents were invited to provide any additional comments about the Westcoast salmon fishing industry, and the Department of Fisheries and Oceans.

Research Design and Methodology

Population of Interest

The populations of interest were commercial salmon fishers particularly trollers, and sport salmon fishers from the region of lower Vancouver Island.

Methods of Gathering Data

The study could best be described as a field-survey. Data were predominantly collected from responses to a survey questionnaire, but also from field observations. A structured survey questionnaire was developed, and consisted of bi-polar interval rating scale items, supplemented by open ended questions (see Appendices A and B). The bi-polar rating scale items were based on nine-point scales.[13] In addition, field notes were made based on interactions with fishers on the docks, and from informal discussions.[14] The qualitative data obtained from fishers' verbal and written comments have not been formally analyzed; they are included along with the findings derived from the survey-questionnaire items in order to provide context to these results.

Sampling Procedure

For pragmatic reasons convenience samples of both groups were conducted.[15] Commercial fishers who worked on salmon trollers were approached on the wharfs where their boats were located in Victoria, Sidney, Sooke, and Nanaimo. They were asked to fill out a questionnaire and told that the researcher would return to pick it up, or if they preferred they could return it by mail. Forty-nine questionnaires were handed out, and 33 were returned, one of which was later discarded because it was not fully completed.

The sport salmon fishers were approached at public marinas in Oak Bay, Saanich, and Sooke. They were asked if they sport fished, and if they did, they were asked to complete a questionnaire. These respondents were also asked if they knew of others who sport fished who would likely being willing to fill out a questionnaire, and if they did, were given additional copies of the questionnaire. This type of "snowball" sampling procedure is common in network studies. Also, members of one local sport fishing association were asked to complete questionnaires. Through a contact, I arranged to attend one of their meetings, and there handed out the questionnaires. These respondents were asked either to mail their questionnaires, hand them in to the university office, or to wait until the researcher returned to collect them. Eighty questionnaires were handed out to sport fishers, and 41 returned. In total, data from 73 questionnaires were analyzed. The response rate was thus 65% for commercial fishers, and 51% for sport fishers (see Table 3.1). Slightly different versions of the questionnaire were given to the two groups. (See Appendices A and B).

Summary of Research Design and Methodology

In summary, this study employed a mixed design combining a structured questionnaire survey with unstructured field interviews. Use of such a mixed design was a strength in that it combined the precision of quantitative data, with the depth of qualitative data. The most serious weakness of the design was its reliance on nonprobability sampling techniques, which limit generalization of the findings.

Results

Before the results are presented, several points about the data to be described require clarification. In the tables and commentary "total" refers to the total number of people who completed a given questionnaire item. Percentages and means for individual items are based on the total number of responses to a given item, not on the total number of people in the sample. Further, the comparisons between association members and non-members for both categories of fishers are based only on data obtained from those respondents who completed the questionnaire item regarding association membership status.[16] Data were also obtained on some variables from questionnaire items which, in the interest of brevity, were not discussed earlier. These variables can be observed in the tables and are largely self-explanatory. They will be examined along with the forementioned variables below.

Effect sizes between groups were obtained by calculating Cohen's d for differences in group means and Cohen's h for proportions. Cohen (1977) provides a guideline for interpreting these values. For d he suggests .2 as corresponding to a small effect size, .5 a medium effect size, and .8 a large effect size. Similarly, for h he designates .2 as a small effect, .5 as a medium effect, and .8 as a large effect.

Cohen cautions that these terms are relative to each other, as well as to the specific content and research method being employed in a given study. However, he states that the benefits to be gained by supplying a common frame of reference outweigh the risks of this relativity.

Thirty-three respondents were commercial fishers. One respondent began filling out his questionnaire but returned it after completing only the first few

questions and hence data from this person was excluded in the analysis (see Table 3.1). Thirty of the respondents indicated they used trolling gear (see Table 3.2). Twelve of the respondents indicated they belonged to a fishery related association (see Table 3.2). Forty-one sport fishers completed survey questionnaires (see Table 3.1). Of these respondents, twelve indicated that they belonged to a fishery related association (see Table 3.2).

Table 3.1: Questionaire Response Rate

Fishing Group	N Handed Out	N Returned	Response Rate
Commercial Fishers	49	32	65.3%
Sport Fishers	80	41	51.3%

Effects of Network Membership

When I discuss contrasts between association members and non-members, I am referring only to people who responded to the questionaire item regarding this issue. Due to the sampling procedures employed in the present study, these results can not validly be statistically generalized to association members and non-members outside of the present sample. However, these findings are suggestive of relations future research should explore.

Although the differences between commercial association members and non-members for most of the questionnaire items were quite small, the direction of the differences lend support to the hypothesis that among those members of the sample, who belong to a Fishery association communicate more with other fishers, hold more "conservation oriented" perceptions and attitudes, and are generally more positive in making social evaluations about other fishers. A similar pattern of results was observed for sport fishers, although these findings were not as consistent.

Table 3.2: Frequency Distributions: All Respondents

Variable	Commercial		Sport		
	N	%	N	%	Cohen's h
Is Respondent a resident of Greater Victoria					
Yes	-	-	39	97.5	-
No	-	-	1	2.5	-
Total	-	-	40	100.0	
Who respondent (usually) goes fishing with:					
Family	-	-	5	13.5	-
Friends	-	-	18	48.6	-
Both	-	-	10	27.0	-
Alone	-	-	1	2.7	-
Alone & Friends	-	-	2	5.4	-
Alone & Family	-	-	1	2.7	-
Total	-	-	37	100.0	-
Zone Fished					
Outside	26	89.7	-	-	-
Inside	2	6.9	-	-	-
Both	1	3.4	-	-	-
Total	29	100.0	-	-	-
Type of Gear					
Troll	30	93.8	-	-	-
Gillnet	5	15.6	-	-	-
Traps	2	6.3	-	-	-
Seine	0	0.0	-	-	-
Fishing Association Membership					
Members	12	40	12	30.8	.19
Non-Members	17	56.7	27	69.2	-
Former Members	1	3.3	-	-	-
Total	30	100.0	39	100.0	-

Table 3.2 (continued)

Variable	Commercial N	Commercial %	Sport N	Sport %	Cohen's h
Association					
Pacific Trollers	12	92.3	-	-	-
Sidney Anglers Association	-	-	8	66.7	-
Other	1	7.7	4	33.3	-
Total	13	100.0	12	100.0	-
Is respondent an active member?					
Yes	10	50.0	10	62.5	.26
No	10	50.0	6	37.5	-
Total	22	100.0	16	100.0	-
Does respondent attend meetings?					
Yes	12	54.5	10	62.5	.16
No	10	45.5	6	37.5	-
Total	22	100.0	40	100.0	-
Does respondent personally know of others who do not always comply with the regulations?					
Yes	17	63.0	23	57.5	.10
No	10	37.0	17	42.5	-
Total	27	100.0	40	100.0	-
Should there be a limit on the number of salmon you can take?					
Yes	11	37.9	36	90.0	1.17
No	18	63.1	5	12.8	-
Total	29	100.0	40	100.0	-

Table 3.2 (continued)

Variable	Commercial N	Commercial %	Sport N	Sport %	Cohen's h
Should there be limited entry in obtaining a commercial fishing license?					
Yes	21	80.8	34	87.2	.16
No	5	19.2	5	12.8	-
Total	26	100.0	39	100.0	-
Is there undue favoritism towards certain fishing groups?					
Yes	25	86.2	31	86.1	0.00
No	4	13.8	5	13.9	-
Total	29	100.0	36	100.0	-
If yes, which groups?					
Seiners	15	51.7	22	71.0	.39
Trollers	2	6.9	7	22.6	.46
Gillnetters	4	13.8	11	35.5	.52
Sport	18	62.1	2	6.5	1.28
Native	17	58.6	11	35.5	.47
Does respondent tell the truth to other fishers about how many fish he/she takes?					
Yes	24	80.0	33	86.8	.19
No	6	20.0	4	10.5	-
Other	-	-	1.0	2.6	-
Total	30	100.0	38	100.0	-
Does the respondent think other fishers tell the truth about how many fish they catch?					
Yes	12	44.4	16	43.2	.02
No	14	51.9	15	40.5	.22
Other	1	3.7	6	16.2	.42
Total	27	100.0	37	100.0	-
Does govt. policy increase or decrease conflict?					
Increase	24	92.3	22	81.5	.30
Decrease	2	7.9	5	18.5	-
Total	26	100.0	27	100.0	-

Table 3.3: Frequency Distributions:

Commercial Fisher Association Members vs. Non-members

Variable	Members		Non-Members		
	N	%	N	%	Cohen's h
Zone Fished					
Outside	12	100.0	13	86.7	-
Inside	0	0.0	1	6.7	-
Both	-	-	1	6.7	-
Total	29	100.0	15	100.0	-
Type of Gear					
Troll	12	100.0	16	100.0	-
Gillnet	2	16.7	3	18.75	-
Traps	0	0.0	0	0.0	-
Seine	0	0.0	4	25.0	-
Association					
Pacific					
Trollers	11	91.7	-	-	-
Other	1	7.7	-	-	-
Total	12	100.0	-	-	-
Does respondent personally know of others who do not always comply with the regulations?					
Yes	9	90.0	8	53.3	.87
No	1	10.0	7	46.7	-
Total	10	100.0	15	100.0	-
Should there be a limit on the number of salmon you can take?					
Yes	5	41.7	5	33.3	.19
No	7	58.3	10	66.7	-
Total	12	100.0	15	100.0	-

Table 3.3 (continued)

Variable	Members		Non-members		
	N	%	N	%	Cohen's h
Should there be limited entry in obtaining a commercial fishing license?					
Yes	11	91.7	8	66.7	.65
No	1	8.3	4	33.3	-
Total	26	100.0	39	100.0	-
Is there undue favoritism towards certain fishing groups?					
Yes	8	80.0	15	88.2	.22
No	2	20.0	2	11.8	-
Total	10	100.0	17	100.0	-
If yes, which groups?					
Seiners	4	50.0	9	60.0	.20
Trollers	1	12.5	2	13.3	0.00
Gillnetters	2	25.0	2	13.3	.31
Sport	7	87.5	9	60.0	.66
Native	8	100.0	8	53.3	1.51
Does respondent tell the truth to other fishers about how many fish he/she takes?					
Yes	10	83.3	12	75.0	.20
No	2	16.7	4	25.0	-
Total	12	100.0	16	100.0	-
Does the respondent think other fishers tell the truth about how many fish they catch?					
Yes	5	41.7	5	35.7	.12
No	5	41.7	9	64.3	-
Other	1	8.3	0	0.0	-
Total	11	100.0	14	100.0	-
Does govt. policy increase or decrease conflict?					
Increase	10	90.9	13	92.9	.07
Decrease	1	9.1	1	7.1	-
Total	11	100.0	14	100.0	-

Table 3.4: Frequency Distributions:

Sport Fisher Association Members vs. Non-members

Variable	Members		Non-members		
	N	%	N	%	Cohen's h
Is Respondent a resident of Greater Victoria					
Yes	10	91.7	26	96.3	-
No	1	8.3	1	3.7	-
Total	11	100.0	27	100.0	-
Who respondent (usually) goes fishing with:					
Family	2	16.7	3	13.5	-
Friends	4	33.3	13	54.2	-
Both	3	25.0	7	29.2	-
Alone	1	8.3	0	0.0	-
Alone & Friends	1	8.3	1	4.2	-
Alone & Family	1	8.3	0	0.0	-
Total	12	100.0	24	100.0	-
Association					
Sidney Anglers Association	-	-	8	66.7	-
Other	1	7.7	4	33.3	-
Total	13	100.0	12	100.0	-
Is respondent an active member?					
Yes	10	83.3	-	-	-
No	2	16.7	-	-	-
Total	12	100.0	-	-	-
Does respondent attend meetings?					
Yes	10	83.3	-	-	-
No	2	16.7	-	-	-
Total	12	100.0	-	-	-
Does respondent personally know of others who do not always comply with the regulations?					
Yes	6	50.0	16	61.5	.24
No	6	50.0	10	38.5	-
Total	12	100.0	26	100.0	-

Table 3.4 (continued)

Variable	Members N	Members %	Non-members N	Non-members %	Cohen's h
Should there be a limit on the number of salmon you can take?					
Yes	10	83.3	24	92.3	.28
No	2	16.7	2	7.7	-
Total	12	100.0	26	100.0	-
Should there be limited entry in obtaining a commercial fishing license?					
Yes	8	72.7	24	92.3	.52
No	3	27.3	2	7.7	-
Total	11	100.0	26	100.0	-
Is there undue favoritism towards certain fishing groups?					
Yes	8	100.0	22	84.6	.80
No	0	0.0	4	15.4	-
Total	8	100.0	26	100.0	-
If yes, which groups?					
Seiners	6	75.0	16	72.7	.05
Trollers	0	0.0	7	31.8	1.20
Gillnetters	2	25.0	9	40.9	.34
Sport	0	0.0	2	9.1	.61
Native	1	12.5	9	40.9	.65
Does respondent tell the truth to other fishers about how many fish he/she takes?					
Yes	11	100.0	21	84.0	.82
No	0	0.0	3	12.0	-
Other	-	-	1	3.7	-
Total	11	100.0	25	100.0	-

Table 3.4 (continued)

Variable	Members		Non-members		
	N	%	N	%	Cohen's h
Does the respondent think other fishers tell the truth about how many fish they catch?					
Yes	5	55.6	10	38.5	.34
No	4	44.4	10	38.5	-
Other	-	-	6	23.1	-
Total	9	100.0	26	100.0	-
Does govt. policy increase or decrease conflict?					
Increase	6	100.0	16	80.0	.93
Decrease	0	0.0	4	20.0	-
Total	6	100.0	20	100.0	-

Table 3.5: Means, S.D., & N. for Rating Scale Items[1]:

All Respondents

Variable	Commercial			Sport			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
Percentage of other fishers respondent thinks follow the regulations[2]	73.4	31.7	23	76.5	18.3	37	.13
Satisfaction	4.7	2.1	30	4.2	2.4	38	.22
Success	4.1	1.7	30	4.7	1.4	38	.39
State of B.C. rivers & streams	6.1	1.2	29	4.9	2.0	39	.72
State of B.C. coastal waters	4.6	1.8	30	4.8	1.8	39	.11
State of B.C. salmon stocks	4.0	1.6	26	-	-	-	-
State of sockeye stocks	-	-	-	4.2	1.5	34	-
State of pink stocks	-	-	-	4.7	1.8	37	-
State of coho stocks	-	-	-	4.1	1.6	40	-
State of chinook stocks	-	-	-	3.4	1.8	38	-
Damage by foreign fleets	3.0	2.1	30	2.6	1.4	39	.23
Enforcement: volunt.- stringent	6.8	2.6	30	6.7	2.5	40	.04
Catches: free - equal	3.5	3.4	30	-	-	-	-

Table 3.5 (continued)

Variable	Commercial			Sport			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
Socialism - Free Enterprise	7.8	1.8	30	5.5	2.3	34	1.11
Pressure from government	3.6	2.1	29	6.1	1.7	37	1.33
Pressure from society	6.1	2.4	29	6.8	1.7	37	.35
Chance of being caught[3]	4.3	2.4	28	2.8	1.3	40	.86
Damage from a small illegal catch	5.3	2.8	28	6.2	2.5	39	.34
Guilt from breaking regulations	5.1	3.0	27	4.2	2.6	37	.33
Effectiveness of govt. policy	6.5	2.2	28	6.2	1.9	41	.15
Fairness of CDA - U.S. Treaty	5.8	1.9	29	-	-	-	-
Trust in other fishers	4.4	2.3	29	5.0	1.8	41	.30
Trust in D.F.O.	7.0	1.6	30	5.1	2.2	41	.98
Anonymity	6.3	2.3	30	-	-	-	-
Communicate: about fishing	3.2	2.0	31	3.9	1.7	39	.38

Table 3.5 (continued)

Variable	Commercial			Sport			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
Communicate: about policy	3.2	2.0	31	6.2	2.4	39	1.35
Communicate: about other things	3.9	2.2	31	4.7	2.1	37	.37
Evaluation: government info.	7.3	2.0	31	5.2	2.3	40	.97
Attribution: Commercial fishers	5.6	2.7	28	-	-	-	-
Attribution: Foreign fishers	4.1	2.7	27	-	-	-	-

1. Rating scale items range from 1.00 to 9.00 unless otherwise indicated. (See Appendices A and B)

2. Possible values for this item range from 0.00 to 100.00.

3. Possible values for this item range from 1.00 to 10.00.

Table 3.6: Means, S.D., & N. for Rating Scale Items[1]:

Commercial Fishers
Association vs. Non-association Members

Variable	Members			Non-members			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
% of other fishers who follow the regulations[2]	78.9	26.4	9	65.8	35.9	12	.37
Satisfaction	4.2	2.2	12	4.9	2.2	16	.32
Success	3.8	1.1	12	4.4	2.0	16	.37
State of B.C. rivers & streams	6.1	1.5	12	5.7	1.9	15	.23
State of B.C. coastal waters	5.1	1.7	12	4.1	1.4	16	.42
State of B.C. salmon stocks	3.9	1.9	11	4.0	1.5	14	.06
Damage by foreign fleets	3.6	1.7	12	2.7	2.4	16	.43
Enforcement: volunt. - string.	6.4	2.6	12	7.3	2.3	16	.37
Catches: free - equal	2.0	2.5	11	4.3	3.5	17	.74
Socialism - Free Enterprise	8.1	1.8	12	7.8	1.7	16	.17
Pressure from government	3.3	2.0	12	3.9	2.3	15	.28
Pressure from society	5.8	2.7	12	5.9	2.2	15	.04
Chance of being caught[3]	4.4	3.4	12	3.2	2.1	14	.44

Table 3.6 (continued)

Variable	Members			Non-Members			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
Damage from a small illegal catch	5.2	3.2	12	5.0	2.5	14	.07
Guilt from breaking regulations	5.5	3.2	12	5.2	2.7	13	.10
Effectiveness of govt. policy	6.3	1.9	12	6.7	2.6	14	.18
Fairness of CDA - U.S. Treaty	4.8	1.5	12	7.0	1.8	12	1.33
Trust in other fishers	4.3	2.1	12	4.7	2.5	15	.17
Trust in D.F.O.	6.8	1.6	12	7.3	1.6	16	.31
Anonymity	6.3	2.3	12	6.1	2.4	16	.08
Communicate: about fishing	3.3	2.1	12	3.1	2.1	17	.10
Communicate: about policy	3.6	2.3	12	2.8	1.7	17	.41
Communicate: about other things	4.3	2.7	12	3.6	1.9	17	.31
Evaluation: government info.	6.7	2.4	12	7.9	1.4	15	.65
Attribution: Commercial fishers	5.3	2.7	12	5.5	3.0	15	.07
Attribution: Foreign fishers	4.8	2.6	11	3.9	3.0	14	.32

Table 3-6 (continued)

1. Rating scale items range from 1.00 to 9.00 unless otherwise indicated (see Appendix 1).

2. Possible values for this item range from 0.00 to 100.00.

3. Possible values for this item range from 1.00 to 10.00.

Table 3.7: Means, S.D., & N. for Rating Scale Items[1]: Sport Fishers

Association vs. Non-association Members

Variable	Members			Non-members			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
# of days fished[2]	39.5	28.6	10	19.8	19.8	25	.88
% of other fishers who follow the regulations[3]	76.7	16.5	11	76.4	19.5	24	.02
Satisfaction	3.9	2.1	12	4.5	2.5	24	.25
Success	4.3	1.4	12	4.8	1.4	24	.36
State of B.C. rivers & streams	4.7	1.2	12	5.0	2.1	25	.17
State of B.C. coastal waters	4.7	1.5	12	4.7	2.1	25	0
State of sockeye stocks	4.0	1.1	8	4.3	1.6	24	.20
State of pink stocks	4.1	1.2	9	5.0	1.8	26	.55
State of coho stocks	3.6	1.3	11	4.4	1.7	27	.50
State of chinook stocks	3.5	0.7	10	3.4	2.1	26	.06
Damage by foreign fleets	2.4	0.8	10	2.7	1.6	27	.22
Enforcement: volunt. - string.	5.5	2.6	11	7.3	2.3	27	.75
Socialism - Free Enterprise	6.1	2.9	9	5.3	2.1	23	.34

Table 3.7 (continued)

Variable	Members			Non-Members			
	Mean	S.D.	N.	Mean	S.D.	N.	Cohen's d
Pressure from government	5.3	1.6	12	6.5	1.7	23	.72
Pressure from society	7.0	1.7	12	6.7	1.9	23	.16
Chance of being caught[4]	2.6	1.2	12	2.9	1.4	26	.22
Damage from a small illegal catch	6.8	1.6	10	6.0	2.7	27	.33
Guilt from breaking regulations	3.8	2.4	11	4.5	2.7	25	.42
Effectiveness of govt. policy	5.6	1.5	12	6.5	2.0	27	.49
Trust in other fishers	5.1	1.7	12	5.0	2.0	27	.05
Trust in D.F.O.	4.6	1.6	12	5.4	2.5	27	.36
Communicate: about fishing	3.0	1.1	12	4.3	1.8	25	.83
Communicate: about policy	5.2	2.6	12	6.8	2.2	25	.69
Communicate: about other things	4.6	1.6	11	4.5	2.2	24	.07
Evaluation: government info.	4.3	1.8	11	5.7	2.3	27	.65
Attribution: Commercial fishers	5.3	2.6	11	5.7	2.3	27	.17
Attribution: Sport fishers	4.2	2.4	11	4.3	2.4	27	.04

Table 3-7 (continued)

1. Rating scale items range from 1.00 to 9.00, unless otherwise indicated (see Appendix B).

2. This refers to the number of days fished in the previous year. Possible values for this item range from 0 to 365.

3. Possible values for this item range from 0.00 to 100.00.

4. Possible values for this item range from 1.00 to 10.00.

In the present sample it was found that commercial association members communicated more with other fishers about fishing (d=.10), and fishery policy (d=.41), as well as other topics (d=.31) (see Table 3.6).[17] Past research has shown that the ability to communicate, enhances cooperative behavior and resource preservation (see Dawes et al, 1977; Edney and Harper, 1978; Brechner, 1977). Being a member of an association links a person to social reference points, enhances the exchange of information with relevant others, and sets the context in which attitudes are formed and reinforced. Association members felt more pressure to follow the regulations from government (d=.28). Association members more positively evaluated information from the Department of Fisheries and Oceans (d=.65), the fairness of a recent fishing treaty with the U.S. (d=1.33); and the effectiveness of government policy (d=.18) (see Table 3.6). These findings are probably due to information exchange and interaction between government and association officials, who act as "opinion leaders" (Coleman, Katz, and Menzel, 1966). Through them, information and social pressure is likely dispersed amongst group members.

Sport association members were more likely to communicate with other fishers about fishing (d=.83), and about fisheries policy (d=.69). As noted earlier, the variable "communication" has been found to be highly related to cooperative behavior in simulated commons and social dilemmas. Association members also felt more pressure from government to follow the regulations (d=.72), and were more likely to think that taking a small catch illegally was harmful to salmon stocks (d=.33). Sport association members were more likely to report that they would feel guilty if they significantly broke the regulations (d=.42) (see Table 3.7).

This pattern of findings is interesting and may have important implications for enhancing conservation orientations among resource harvesters. If renewable resources are to be maintained, people must refrain from taking more than their share. As Hardin (1968) has noted in his analogy of the herdsmen and their common pasture, if people exploit an extra portion of the commons over their share, the collective result is ruin. Violation need not be on a large scale. That small increments of over-use by individuals collectively and cumulatively lead to disaster is a subtle point, and not immediately apparent to the average individual caught up in the "currents and eddies" of a complex social system. When people who are members of such a system understand this point, a step towards resolving the dilemma of the commons will have been achieved.

In the sample commercial association members were more aware of the depletion of salmon stocks (d=.06), of pollution (d=.23 and d=.42), and of the potential harm caused by taking a small catch of salmon illegally (d=.37) (see Table 3.6). This pattern of results would seem to indicate that commercial association members were better informed about "conservation" issues than were non-association members. They also felt that catch limits should be imposed (h=.19), and that there should be limited entry in obtaining a commercial license (h=.65) (see Table 3.3). Non-association members, however, were substantially more likely to think that catch limits should be stringently enforced (d=.37) (see Table 3.6).

In contrast, a different pattern of results was observed for sport fishers. A slightly higher proportion of sport non-association members thought there should be a limit on the number of salmon one can take (h=.28), and that there should be

limited entry in obtaining a commercial salmon fishing license (h=.52) (see Table 3.4). Non-association members were also substantially more likely to favour stringently enforced catch limits (d=.75) (see Table 3.7). Non-members perceived B.C.'s rivers and streams to be more polluted, compared to association members (d=.17) (see Table 3.7). Association members and non-members were relatively neutral in their evaluations of the quality of coastal waters. Amongst sport fishers, association members perceived sockeye salmon stocks to be slightly more depleted than did non-association members (d=.20). Association members perceived pink and coho salmon stocks to be substantially more depleted than did non-association members (d=.55 and d=.50), while non-association members perceived chinook salmon stocks to be slightly more depleted than did association members (d=.06) (see Table 3.7).

There was a substantial amount of concern voiced by both commercial and sport fishers[18] about salmon stocks, and about pollution:

> Money should be spent on natural habitat (fixing streams ruined by logging. Fishermen could do this in the off season). (CF)
>
> Just ask an older person what the fishing used to be like in these waters. In one day 150 lbs to 200 lbs of salmon could be brought in easily. Today, probably an average of 50-60 lbs during a year of fishing regularly. (SF)
>
> Give Native Indians responsibility of stewardship of streams and of enhancing salmon stocks. In exchange divide catch 1/2 to Natives and 1/2 to Whites. (SF)
>
> Do away with the Indians' techniques of fishing, i.e. netting river mouths, and spearing. (SF)
>
> To me it is incredible that the salmon industry - (like forestry) appears to be in serious trouble in B.C. Surely in both cases it is a matter of reasonable 'harvesting' of resources coupled with reasonably replenishing them. (SF)

> Have agents at most land areas and marinas to check for catches over limits. Make penalties for violations more severe. (SF)
>
> Seiners should be limited to fishing at river mouths. (SF)
>
> I feel that if the fishery must have net fishing, set up weirs on the river - that way there would be more control over the catch. (SF)
>
> For overall effectiveness on regulation of trollers, there is a lack of commitment by both fishermen and Fisheries. (CF)
>
> Close all fisheries for 4 years. Cut off sport fishermen from July 1 to September 1. Pay fishermen their average for 4 years. Stop seiners from fishing in the strait. Stocks are too depleted. U.S. dams are destroying the salmon streams. Indians deserve a share of the profit from the dams. (CF)
>
> The freighters dump out everything along with water from their ballasts. The water is terribly polluted. (CF)
>
> A major problem is the forest industry - destroying the streams, rivers etc. with greedy and indiscriminate logging ... leaving felled trees because they're not as profitable ... that should be one of the concerns of fisheries policies ... but of course, forests are run by the provincial government, while fisheries are run by the "feds". (CF)

Commercial association members in the sample felt less anonymous about the numbers of fish they took (d=.08) (see Table 3.6). This supports the cooperation thesis in that anonymity has been found to be related to defection in commons dilemmas (see, Cass and Edney, 1978). Social networks can influence both visibility and trust. Trust of others is probably inversely related to the anonymity of one's actions. The more public others' behaviors are, the less relevant "trust" is, in one sense, because the individual can react in direct correspondence to others' behavior.

Commercial association members were more likely to trust other fishers with regard to the information they received from them about fishing (d=.17), and to trust the information they received from the D.F.O. (d=.31) (see Table 3.6). Trust

has been identified as an extremely important variable in eliciting cooperation in commons dilemmas (see Edney, 1980; Dawes, 1980; Pearse, 1982). Like their commercial counterparts, sport association members were also more likely to trust the information they received from the D.F.O. (d=.36) (see Table 3.7). With regard to trust, several commercial fishers commented:

> The Indians are distrustful. The White man beats them at fishing. Company foreclosed on Indian boats and now owns them ... B.C. Packers.
>
> I would trust other fishermen with my life, - but not with my wife - or any other bullshit.
>
> One commercial fisher who did not fill out the questionnaire said: "You will have a hard time getting people to fill it out. The "feds" will, or can use the information and turn it against us."
>
> Many fishermen are distrustful and are bad tempered because of the banks ... the banks have been taking our boats away. See that blue one over there? That was worth $250,000. The bank took it and sold it for $70,000. ... My boat 2 years ago - I owed $2,500 - and the bank tried to take it away. I said you might as well cut off both of my bloody arms. I'm demoralized.

Commercial fishers who were association members were more likely to report telling the truth to other fishers about how many fish they took than were non-association members (h=.20) (see Table 3.3). Sport association members were more likely to tell other fishers the truth about how many fish they catch (h=.82) (see Table 3.4). This pattern of results lends support to the network thesis. Network members perceive themselves to be more visible, tend to communicate more with other fishers, and be more trusting of others. This increased trust probably influences individual fishers' truthfulness and, of course, their belief of others.

At first it was conjectured that whether fishers tell the truth to other fishers, would be indicative of the general "psychological" climate of the fishery. That is, telling the truth about how many fish one catches is probably indicative of how much trust an individual has in other fishery participants. Trust has been shown to be associated with cooperative behavior in laboratory simulations. It was conjectured that in the case of the fishery, cooperation can be translated into "following the regulations", which leads to enhanced resource conservation. Thus it was thought that "telling the truth" would be related to "conservation-oriented behavior". After further analysis of the structure of the fishery, it is clear that the situation is somewhat more complex. From the standpoint of conservation, it does not really matter what one fisher says to another about how many fish they catch - as long as they do not induce others to break the regulations. What is important is that they do not try to poach fish. In fact fishers have an interest in lying to other fishers about the number they catch, and where they catch them. The commercial fishery, in particular, is intensely competitive. This competitiveness has a psychological as well as an economic component. These two components lead to certain paradoxes. On the one hand, from an economic standpoint, a commercial fisher would have an interest in understating the size of his/her catch of fish, to not reveal where it was caught so as to reduce competition, and thus protect his/her material interest. On the other hand, competition has a distinct psychological component of particular relevance to the study of social evaluations. Commercial fishers are very proud of their skills and abilities. From a psychological standpoint, there is some motivation to overstate the size of one's catch as a form of ego enhancement. For both of these reasons there are

motivations to engage in social comparison. What appears to happen is that fishers tell the truth to their close "buddies" and "bullshit" to others. Several comments from commercial fishers illustrate these points:

> ... You are going to hear a lot of bullshit from fishermen. Fishermen lie a lot.
>
> All fishermen lie. How many follow the rules closely - none. People won't fish for free. We take home halibut for our friends, families ... put some in the freezer - nothing large scale, but every fisherman takes fish home. ... I'll go over the line to catch a fish ... to take some home. Everyone cheats, you have to - to survive.

Compared with non-members in the sample, commercial fishers who were association members were more likely to report that they thought other fishers told the truth about how many fish they caught (h=.12) (see Table 3.3). Sport fishers in the sample who were association members were also more likely to report that they thought other fishers told the truth about how many fish they caught compared with non-members (h=.34) (see Table 3.4). The measure of people's evaluations of others truthfulness is, of course, another indicator of trust. Again, increased communication and visibility promoted by a social network likely increased fishers' trust of others.

Commercial association members tended to have more "faith" in estimating the proportion of their collegue's compliance with the regulations (d=.37) (see Table 3.3). Association members were also more sensitive to potential penalties for breaking the regulations (d=.44) (see Table 3.6).[19] There were no substantial differences between sport association members in their estimates of other fishers' compliance (d=.02)

In contrast to the pattern observed for commercial fishers, non- association sport fishers estimated the chance of being caught if breaking the regulations as somewhat more likely than did sport association members (d=.22) (see table 3.7).

Commercial association members were substantially more likely to know of others who do not comply with the regulations (d=.87) (see Table 3.3). On the surface this finding seems puzzling since it appears that association members are more cooperative and likely to follow regulations - and as reports about others are often somewhat reflective of self's behavior (see Hedley, 1986). However, precisely because they are association members, these fishery participants are more likely to be linked to other members of a fishery relevant social network, and thus more likely to receive information about other people - such as unlawful behavior - than are untied individuals. This interpretation is supported by the observation that commercial association members perceived themselves to be highly visible (public).

Sport non-association members were more likely to know of others who do not always comply with the regulations (h=.24) (see Table 3.4). This finding is opposite in direction to that between commercial association members and non-members noted above. A possible explanation for this discrepancy might be the nature of compliance in these two fisheries. Cheating in the commercial fishery is probably on a larger scale and may include systematic poaching operations and "black market sales". People might initially hear about these infractions through their social network - which would make association members more likely to know of others who do not comply with the regulations. On the other hand, reporting knowledge of others cheating in the sport fishery might be more reflective of people's general compliance - because violations may be less visible. Whether a commercial fisher is breaking regulations is somewhat more obvious. For example, a fisher working in an area that has been closed, is highly

visible. When a commercial boat leaves and arrives in dock is quite obvious. Its gear is highly visible from a distance. It is probably quite difficult to smuggle large quantities of fish. On the other hand, sport fishers are less visible as they come and go, take much smaller catches which are easier to conceal, their gear is not highly visible from a distance, and they are not subject to openings and closings. Their comings and goings are more anonymous as their vessels are put into the water often from private and/or distant ramps as opposed to operating from centrally located wharfs. There are far more recreational vessels than commercial fishing vessels. Recreational vessels are smaller than commercial ones, and not all recreational vessels are engaged in fishing. Considering these factors, one may conclude that poaching a small number of fish is probably relatively easy. However, because sport fishers are not as highly visible, knowledge of sport fishers's violations are less likely to be obtained through "the grape vine". Social research has shown that there is some tendency to project one's own behavior, motives, etc. on to others especially if the others are not personally known to the respondent. Therefore it may be that sport non-association members increased likelihood of knowing others who do not comply with the regulations actually reflects their own increased likelihood of not following the regulations.

All commercial fishers in the sample tended to attribute the behavior of Canadian commercial fishers to the situation rather than to personal characteristics, while they attributed the behavior of foreign fishers more to personal characteristics (see Table 3.2). What does this mean? As observed by fishers' ratings of salmon stocks, it is generally conceded that the salmon fishery

is threatened by the depletion of stocks. Respondents judged the damage done to salmon stocks by foreign fishers to be severe. This finding suggests that commercial fishers are blaming foreign fishers for the depletion of salmon stocks, because of personal characteristics such as greed. At the same time, they are absolving themselves of blame. They are merely reacting to the situation - trying to conserve, yet under financial pressure to harvest fish. This finding is an example of a self serving bias - a bias in cognitions favoring the self (see Fiske and Taylor, 1984), or in this case the local group. This type of finding illustrates how depicting commons dilemmas purely in terms of game theory, can be distorting - because of cognitive biases, people are probably not completely rational actors when rational action is viewed objectively.

Compared with non-members, association members perceived the harm done to salmon stocks by foreign fishers as less severe (d=.43)(see Table 3.6). Although the issue of how many fish are taken by foreign fishers is an empirical question, this perception on the part of association members probably indicates they are less biased than non-members. There is a natural bias towards self interest in making evaluations about self and others. This lessened bias probably reflects the greater knowledgeability of association members due to information exchange via their ties with other association members, and in particular with association officials. Overall, there was substantial concern voiced by commercial fishers about foreign fleets. Comments from commercial fishers about foreign fleets included the following:

> Foreign fishermen, with the present boundaries, are not being enforced enough.

> As for foreign fishermen within the boundary, there is hardly any enforcement of regulations at all.

Canadian salmon fishermen do not want to lose their fisheries (stock or livelihood) to seiners and/or the Americans.

The foreign fleets do not damage our stocks - but they hurt us in competition.

As discussed earlier, compared with non-members, commercial association members more highly evaluated D.F.O. information, the fairness of a recent fishing treaty with the U.S., and the effectiveness of government policy (see Table 3.6).[20] Likewise, sport association members also evaluated the information provided to them by the D.F.O. more positively. These findings are probably due to enhanced communication made possible through group membership. Being a member of an organized group, places an individual in an information network. Also noted earlier, association members communciated more with other fishers about fishing, and about fisheries policy. This increased communication probably led not only to heightened awareness about policy details but also to a greater understanding of policy implications. Dispersal of D.F.O. information likely occurs through association officials, and subsequent discussion of D.F.O. policy between association officials and other network members. This result is a positive one, enhancing conservation orientations on the part of association members.

There was little difference between commercial association members and non-members in their evaluations of salmon fisheries policy. The majority of commercial fishers thought that government policy increased conflict (see Table 3.2). On average, sport fishers who were association members evaluated government policy as more effective, in comparison to non-association members (d=.49) (see Table 3.7). Association members were more likely than non-members to think that government policy increased conflict (h=.93) (see Table 3.4).

Commercial association members evaluated themselves to be more successful as fishers (d=.37), relative to non-members, and were more satisfied with fishing as an occupation (d=.32) (see Table 3.6). Communication probably influences success. Fishers discuss "hot" fishing grounds, and what types of tackle seem to work best. Being in a social network probably increases an individual's chances of being in "the know" - and increases his/her chances of success. From an equity perspective this finding also tends to support the inference that association members are more likely to cooperate than non-members. As non-association members may be frustrated with their relative lack of success, they are probably more likely to adopt measures to alter their payoffs.

With regard to occupational satisfaction, "lifestyle" was an important consideration mentioned by commercial fishers in their comments to me. For instance, one respondent said he fished:

> ... because of the lifestyle. To be a fisherman you have to be a gambler. You have to love doing it. You might make quite a lot of money one year, and not even a decent wage the next. ... People love the lifestyle that's why they fish. They are individuals ... they do not have a boss on their back looking over them ... they can do as they please.

Sport association members were also more likely to evaluate themselves as successful fishers (d=.36) (see Table 3.7). As with commercial association members, their success is probably enhanced through group membership by the knowledge and tips they acquire from others.[21] Sport association members were also more satisfied with fishing as a recreational pastime, than were non-association members (d=.25) (see Table 3.7).

Freedom is a very important component of the commercial fishers' lifestyle. Related to freedom, commercial fishers also place high value on competition and

individualism. Some consider commercial fishermen as "the last cowboys". The majority of commercial fishers I talked with considered themselves to be independent business people, or entrepreneurs. They fished because they enjoyed competition, the chance to be their own boss, and the opportunity to earn money on the basis of how hard they worked. In fact, one of the original questionnaire items asked: "How could the government decrease competition?" - as reducing competition and enhancing cooperation is a standard strategy employed by social psychologists for solving social dilemmas in the experimental research literature. (This is often done by altering the reward structure to favor prosocial behavior.) The predominant response to this question was, "Why should they?" Some comments illustrating the importance of freedom, competition, and individualism to the commercial fishers' lifestyle, follow:

> ... When we got into this industry it was quite lucrative. We were free to be our own bosses ... but now it isn't.
>
> Leave fishermen alone, let them be independent, competitive ... protect the resource, but let us be free.
>
> Competitiveness is part of the nature of the commercial fishing industry. Fishermen are happy and take pride in catching more fish than others.
>
> Fishing should be competitive - it's human nature. If you set limits, people would sit around while others worked. The main thing is that we want people (the government) to leave us alone. We'll take U.I.C. and scam them anyway we can. But we just want to be left alone - to be free to catch as many fish as we can. ... competition is human nature - that's why most of us are out here. I'm happy as hell if I catch more fish than he does.

The "tragedy" of the commons seems even more evident in light of these comments. Freedom, individualism, and competition are the essence of what draws people into the fishing industry, what motivates thems. However, if Hardin

(1968) is correct, these characteristics are fatal flaws. Freedom and competition will lead to resource depletion and eventually to the extinction of the industry and the commercial fishers' way of life.

One commercial fisher, in discussing conflict in the fishery, reduced stocks, and the commercial fishers' image and way of life, commented:

> We're up there with hookers for popularity, and it's a shame ... we are a cultural tradition - like the prairie farmers - but we're quickly on the way out ... disappearing.

While all commercial fishers placed high value on free enterprise, relative to socialism, association members valued free enterprise slightly more than did non-association members (d=.17) and were substantially less likely to believe that the fishery should be regulated to ensure relatively equal catches (d=.74) (see Table 3.6). Sport fishers who were association members were also somewhat more likely to value free enterprise over socialism relative to non-members (d=.34) (see Table 3.7). This result contradicted the original working hypothesis, which argued that people who join a fishery association are probably less independent than non-members, and thus relatively more egalitarian. Non-members, being more independent, would be more likely to favour free enterprise, while association members, being more egalitarian, would hold political attitudes that were relatively less conservative than non-members. Just the opposite was found. In fact, association members valued free enterprise substantially more than did non-members. In general, the high value placed on free enterprise by commercial fishers compared with sport fishers, is probably reflective of the ideology of the fishery. That free-enterprise was more highly valued among commercial association members, is probably due to promotion of this value in the network

(see Erickson, 1982). This result also makes sense in light of the other findings, and the general nature of the commercial salmon fishery. As noted, people who become commercial fishers generally place a high value on independence and free enterprise, and the commercial fishery is highly competitive. It would seem natural that those people who communicated more often with similar others on an occupational basis, should more intensely value free enterprise.

This analysis also sheds light on the seemingly contradictory finding that association members thought they should be free to catch as many fish as possible (see Table 3.6). Initially, this outcome seemed to contradict the general pattern of findings. Based on the assumption that compared with non-members, association members are more conservation-minded, one would expect them to place less value on being free to catch as many fish as they can. Further, it was originally assumed that since association members would be more egalitarian due to group influences and pressures, they would also be relatively more likely to favor catches being regulated so they are equal. The assumption that association members would be less likely to place value on free enterprise was proven to be erroneous by the data. However, it does not follow, that just because association members place a higher value on being able to catch as many fish as they want, that they are less conservation-minded than non-members. Association members did think that there should be a limit on the number of salmon one can catch and on obtaining a commercial fishing license. Apparently, they thought there should be overall limits on the number of salmon caught in order to protect the resource, but that they should be able to compete for fish within this limit. The comments of one fisher illustrate this conclusion:

> I believe in a free market ... a total catch limit is okay for the industry but there should not be individual catch limits. ... The government should protect the stocks, but should leave fishermen alone. I'm willing to fish for only 3 months if the government wants to protect the resource - but I should be able to catch as many fish as I can.

Another seemingly anomalous finding is that relative to non-members, association members reported they would feel less guilty if they significantly broke the regulations (d=.10) (see Table 3.6). This finding may be explained in part by the inference that there is less need for association members to feel guilty as they are less likely to break the regulations in the first place.

The following findings appear to contradict the hypothesis that belonging to a fishery association is related to increased concern with conservation issues. Sport non-association members felt more pressure from society to follow the regulations (d=.16) (see Table 3.7). This may be in part due to association fishers perceptions of pressure from society relative to the pressure they felt from government.[22]

Sport non-members were more likely to think there should be a limit on the number of salmon one can take (h=.28) (see Table 3.4). The difference between association members and non-members was not large (9%) but is interesting for several reasons. Based on the initial hypothesis and on the general pattern of findings one would expect association members to be more likely to think there should be a limit on the number of salmon one takes. However, this was not the case. This finding is probably due to differences in self-interest between the two categories of sport fishers. Association members spend more time fishing, and are probably more committed to fishing as a pastime. One indication of this, is the fact that they belong to an angling association. For association members sport

fishing is a lifestyle. These people spend substantial portions of their disposable income on their boat engines, trailer, rods, tackle, etc.. They also spend many weekends on the water. For these fishery participants, imposing a limit on the number of fish they can catch, threatens a key recreational outlet - whereas imposing a catch limit on those who fish only occasionally is much less threatening. The validity of this observation was reinforced at a recent meeting the D.F.O. held for sport fishers about new fishing restrictions that were being implemented (Pat Bay, B.C., March 23, 1988). At the meeting, the Minister of Fisheries and Oceans and his officials explained that the new regulations were being implemented to protect chinook stocks. It was announced that catch limits were being reduced from 20 to 8 chinook a year, in addition to some additional regulations such as tagging each chinook caught. The Minister announced that because of the way the annual catch is distributed amongst fishers this reduction would only amount to about 20% of the total capture of chinooks. For instance, 5-10% of fishers catch about 50% of the fish. Sport fishers who attended this meeting were outraged and claimed the reduction was actually 60 %.[23]

Sport non-members were more likely to think there should be limited entry in obtaining a commercial salmon fishing license (h=.52) (see Table 3.4). This finding also appears to be somewhat anomalous with the general hypothesis regarding the effects of network membership on eliciting conservation-oriented cognitions. A similar process may be occuring as in the case of catch limits, although in this instance, association members might be guided by empathy for entrepreneurs rather than self-interest. Supporting this interpretation is the fact that association members valued free enterprise more highly than did non-members. Sport

non-association members were also more likely to favor stringently enforced catch limits. Again this may be due to association members' interest "in being free to pursue a certain lifestyle". These findings regarding catch limits, license restrictions, and enforcement, contradict the assertion that association members are more conservation oriented.

Summary

Recall the illustration of the farmers and their common pasture that was presented in the first chapter. Network processes similar to those outlined appear to be operating in the B.C. commercial salmon fishery - at least for those participants on whom data were collected in the present study. The effects of these processes are summarized below.

In the sample these results indicate that social networks influence behavior and cognitions in the commons. It was observed that compared with non-members, association members were more likely to communicate with, and trust, other fishers. They were more likely to tell the truth and believe others with regard to information about catches. They felt less anonymous and felt more pressure from the government to comply with the regulations. Commercial association members more highly evaluated a recent treaty between Canada and the U.S. They evaluated the quality of D.F.O. information more positively, and were more likely to trust this information. Commercial association members were more sensitive to declining salmon stocks, and to pollution. They were more likely to think others complied with the regulations and were more aware of the possibility of being penalized for non-compliance. Association membership increased the likelihood of fishers personally knowing of others who did not follow the

regulations. Association members were not as biased against foreign fishing fleets. Association members rated themselves as more successful (as fishers), and were more satisfied with fishing as an occupation. Association members placed more importance on certain social values. In addition to conservation, they valued free enterprise more highly. These results would be worth looking at in the future.

Conclusions

In general these findings lend support to the hypothesis that, among members of the sample, social networks influence behavior and cognitions in the commons. In particular, network affiliation can lead to increased conservation-orientation in resource commons such as the salmon fishery. One interesting qualification is that, although commercial association members are concerned with the state of the resource, and place value on policies designed to protect it, they also highly value competition and free enterprise. As a collective group they are willing to conserve, and have a limit placed on the total number of fish they can harvest. Within this limit, however, they place a high value on being able to compete for fish. These interpretations should be considered speculative until the present findings can be replicated.

It should be kept in mind that although there were a large number of items supporting the general hypothesis that membership in a resource relevant network influences conservation-oriented attitudes, perceptions, evaluations and behavior (in certain situations), the size of the effects observed in this study were generally small. Further, although the overall pattern of results were similar for both categories of fishers, it was more consistent for commercial fishers.

Differences Between Commercial and Sport Fishers

Although the main focus of the present analysis is to examine network influences on cognitions and behaviors, differences between categories of fishers have also been explored. A number of differences on questionnaire items were observed between the two groups that were studied. These differences are largely due to to group interests, and differing sets of experiences. These findings are somewhat subsidiary to the main theme of my thesis, but are reported in the interest of completeness.

Compared with sport fishers, commercial fishers in this study communicated substantially more with other fishers about fishing (d=.38), about fisheries policy (d=1.35), and with other fishers about things other than fishing (d=.37) (see Table 3.5). Members of both fishing groups felt relatively little pressure from society to follow the regulations. Commercial fishers felt relatively more pressure from society than did sport fishers (d=.35) (see Table 3.5). Commercial fishers also felt substantially more pressure from the government to follow the regulations in comparison with sport fishers (d=1.33).

Compared with sport fishers in this study, commercial fishers were on average more likely to trust other fishers (d=.30). On the other hand, commercial fishers were substantially more likely to distrust the Department of Fisheries and Oceans (d=.98) (see Table 3.5).

A slightly higher percentage of sport fishers reported telling the truth to other fishers about how many fish they take relative to commercial fishers (h=.19) (see Table 3.2).

Commercial fishers were slightly more likely to personally know of others who do not always comply with the regulations than were sport fishers (h=.10) (see Table 3.2). Commercial and sport fishers were relatively close in their average estimates of other fishers compliance with fishing regulations (see Table 3.5). Commercial fishers, not surprisingly, more highly estimated the percentage chance of being caught (30-40%) if breaking the regulations, than sport fishers (10-20%) (d=.86)- see Table 3.5.

Commercial fishers perceived the state of B.C. rivers and streams as relatively polluted, while sport fishers perceived them to be neither extremely clean nor extremely polluted (d=.72). Both commercial and sport fishers perceived B.C. coastal waters to be relatively clean. Commercial fishers rated them relatively cleaner than did sport fishers (d=.11) On average, commercial fishers perceived B.C. salmon stocks to be relatively depleted (commercial fishers were not asked about the state of the different species of salmon). Sport fishers perceived chinook stocks to be very depleted, coho and sockeye stocks to be somewhat less depleted, and pink stocks to be slightly depleted (see Table 3.5). Sport fishers perceived taking a small catch of salmon illegally to be relatively more harmful than did commercial fishers. (d=.34) Sport fishers also were more likely to report they would feel guilty if they significantly broke the fishing regulations (d=.33) (see Table 3.5). Sport salmon fishers were much more likely to answer yes (90%) to the question of whether there should be a limit on the number of salmon one can take, relative to commercial fishers (38%) (h=1.17) - see Table 3.2. Compared with commercial fishers, sport fishers were also more likely to favor limited entry in obtaining a commercial fishing license (h=.16) (see Table 3.2). Members of both

groups were, on average, about equally likely to favor that catch limits be stringently enforced - as opposed to voluntarily enforced (see Table 3.5). Compared to sport fishers, commercial salmon fishers were substantially more likely to value free enterprise (d=1.11). Commercial fishers highly valued free enterprise, while sport fishers only marginally valued it over socialism (see Table 3.5).

The majority of both commercial and sport fishers thought there was undue favoritism towards certain fishing groups (see Table 3.2). Interestingly, members from both groups thought there was least favoritism towards their own group. This finding would seem to be illustrative of what has been called a "fairness bias" (see Messick and Sentis, 1983).[24] Messick and Sentis (1983:70) state that systematic biases may influence one's perceptions or judgments of fairness.

> These biases may reflect either cognitive consequences of the differential access that one has to one's own, as opposed to others', subjective states or the direct influence of one's desires and preferences on these judgments. (Messick and Sentis, 1983:70)

Members of both categories of fishers seem to be exhibiting a selective bias in their evaluation of government fairness in dealing with different fishing groups. The following comments made by commercial fishers illustrate the general perceptions about fairness and equity held by the commercial fishers surveyed in this study:

> We need fairness in distribution and conservation. However, that's asking a lot of a politician

> The fisheries regulations seem to be increasing an emphasis towards sport fishing. The stocks are being overfished ... the fishery needs to be closed off to sport fishermen and commercial fishermen alike. With doctors and others catching lots of fish sport fishing, it brings down the value of our fish. ... There is favoritism towards seiners. They are wiping out fish in the gulf ... immature fish. ... Fisheries officers look out for certain boats ... board them ... break up their radio frequencies. ... No control over what happens to them.

> ... Commercial fishermen have a bad public image right now and that is just hurting the industry ... The sport fishermen are being favored ... The charter boats are unfair - like the ones Bob Wright runs. They are really commercial operations but are not bound by the same restrictions that we are - they make a killing.

Likewise, sport fishers comments indicated that they perceived a substantial amount of unfairness in the fishery. In particular, their comments were quite defensive about the perceived blame sport fishers were receiving for the state of salmon stocks:

> Stop trying to blame sport fishermen for decreased stocks.
>
> Stop blaming sport fishermen.
>
> Each local fisherman takes enough fish for one family. Each commercial fisherman feeds in the 10,000 families - is there really any question about who takes the most fish?
>
> Too much of the blame is placed on sport fishermen. There should be more controls on foreign (i.e. U.S./Japan, etc.) ... more strictly enforced.

The largest majority of commercial fishers thought there was undue favoritism bestowed upon sport fishers, Native fishers, and seiners. A large majority of sport fishers thought there was undue favoritism directed towards seiners. Lesser numbers of sport fishers thought there was undue favoritism directed towards Gillnetters, Native fishers, and trollers. Ironically, the lowest proportion of sport fishers perceived that, of other fishing groups, there was undue favoritism towards commercial trollers. One may speculate on the reasons for this finding. Trolling is, in fact, the most popular method of sport fishing. It may be that sport fishers identify to some degree with trollers, as they are their "closest cousins". Further, the average troller takes far fewer fish than the average commercial net fishing boat, although it can be argued that they largely fish for different species of

salmon. On the other hand, competition for the same species (chinook, and coho) are probably the reason why the majority of trollers perceived sport fishers to be unduly favored by the government, - especially since, at the time the study was conducted, commercial fishers were having substantial restrictions placed on them in terms of limited openings, while sport fishers remained relatively unaffected by fishery regulations. At present, this pattern of evaluations (about favoritism) may be reversed - as the government has just recently announced dramatic restrictions on the number of chinook salmon sport fishers can catch in one year.[25] The issue of favoritism is related to trust, and is at the core of distributive justice considerations. From a behavior standpoint, the structure of the fishery can be depicted rather crudely as follows: government biologists set limits on the total number of (a specific species) of salmon to be caught by those with a certain type of gear in a specific region. If the resource is to be preserved, these limits must be followed. From a social psychological standpoint, one factor involved in realizing the goal of adherence to the regulated limits would be the degree to which fishery participants feel they are being dealt with equitably by the Department of Fisheries and Oceans. As equity theory states, if inequity is perceived by participants in a social system, then these participants will likely take steps to reduce this inequity. In the case of the Pacific salmon fishery, those participants who feel they have been allotted an inequitable share of the fishery, will be more likely to break the regulations in order to restore the perception of fairness.

Compared to sport fishers, commercial fishers felt substantially more pressure from the government to follow the regulations. On average, commercial fishers

thought that the information they received from the D.F.O. was very poor, while sport fishers' evaluations were relatively neutral (d=.97) (see Table 3.5). This latter difference is probably due to several factors. First, D.F.O. information is much more important to commercial fishers as it is relevant to their livelihood. Second, "the regulations" have tended to change more rapidly for commercial fishers. Openings in the commercial fishery may be declared for only a few days with no advance warning, while the regulations for the sport fishery tend to remain fixed for a year at a time.

Fishers from both categories evaluated government fisheries policy as relatively ineffective. Compared with sport fishers, commercial fishers rated it as more ineffective (d=.15) (see Table 3.5). The majority of fishers from both categories thought that government policy increases conflict. Commercial fishers were somewhat more likely to perceive government policy as increasing conflict (h=.30) (see Table 3.2).

From the comments made by both commercial and sport fishers, it was evident that a considerable amount of hostility was felt towards fisheries policy, the federal government, the Department of Fisheries and Oceans, and the Minister of Fisheries and Oceans. Fisheries policy was generally regarded as ineffective, and blame was placed on the government for being insensitive to the needs of the West, and for "politicking":

> The Department of Fisheries and Oceans is a tool that is being used to change the structure of the fleet as wished by the Liberal Government. They envisioned a small fleet of large boats catching a lot of fish and thereby able to pay a large royalty to Ottawa. They had disregard for the way of life of small independent fishermen. (CF)

> Regulations as existed in 1984 are needed, but the politics of individual groups must be reduced. Everyone must share in the reductions - including sport fishermen. (CF)

Be left alone ... quit changing policy. (CF)

Fisheries Minister Fraser is completely paranoid about making any decisions. (CF)

The D.F.O. should have a Minister who takes an interest in the West coast and knows what he is talking about. (CF)

The Department of Fisheries and Oceans causes most of our problems. They lie to us and use statistics to get whatever they want to balance their pencil pushers. Most should be fired. (CF)

We have depleted our stocks. Ottawa needs to move closer to the concerns of the West. (SF)

In discussing harvesting and replenishment of stocks, one sport fisher said: We seem to have fallen down badly on the latter and even where trained experts in the field advise us of what is needed, all too often politics gets in the way. (SF)

Conclusions about Differences Between Commercial and Sport Fishers

The differences between the groups that were studies are due largely to: 1) the different interests of group members; and 2) different experiences. Most commercial fishers have had much more experience on the water than have the average sport fisher. Based on this greater experience, one would expect commercial fishers to have more accurate perceptions about the state of the environment and the resource.

From a conservation standpoint, commercial trollers are classic commons dilemma participants. They are already highly motivated by self-interest - their inherent entrepreneurial spirit - and are futher motivated to catch as many fish as possible because of the financial structure of the fishery. Most have large financial investments in their boats, and harvesting equipment, and have mortgages with the banks. This is probably true for most commercial salmon trollers, whether they belong to a fishery related association or not.

The situation for sport fishers is somewhat different. Compared with commercial fishers, sport fishers log far fewer hours on the water, and thus are likely to have somewhat less accurate perceptions of the environment/resource due to less experience. There is probably more heterogeneity amongst sport fishers in terms of fishing experience, relative to commercial fishers. There are large variations in terms of experience and interests. There appears to be a subset of sport fishers for whom fishing is an important recreational outlet. These people spend much of their free time, as well as and large portions of their disposable income, on sport fishing. I suspect that many fishers who belong to an angling association fall into this category. Although people who fall into this "fishing as a lifestyle" category are probably very concerned about resource conservation and are probably very knowledgeable about the state of the resource/environment, they have a strong interest in resisting certain salmon enhancement strategies such as catch limits, because they would threaten an important leisure activity for them.

The majority of sport fishers probably engage in fishing for occasional relaxation and diversion. These fishers are probably less knowledgeable about the state of the resource/environment, but because they are less persistent harvesters and probably less skillful fishers, they individually pose less of a threat to resource conservation. These fishery participants have no special interest that is in serious conflict with resource enhancement strategies. The behavior of these participants, however, probably poses a substantial threat to resource conservation in that they may be more likely to break regulations through ignorance of them, or ignorance of the seriousness of the situation and may thus contribute to further depletion of salmon stocks and pollution of the habitat. Also, because they are neither as

environmentally aware and nor as organized, they exert less pressure on the government and on other fishing groups to conserve the resource. Individually, their influence on the state of the resource is minimal - but cumulatively it is great.[26]

In sum, amongst members of the two samples, differences between groups are probably due to differences in experiences and interests, while differences within groups are due to network effects.

Notes

1 There are actually a number of fisheries. The singular form is used for simplicity.

2 The figures cited below are somewhat dated. These figures are for the years immediately preceeding the study and are presented in order to describe the context of the fishery at the time of the study.

3 For the fifth consecutive year, Canada was the world's leading fishery product exporter in these terms. The value of Canadian fishery product exports totalled more than $1.6 billion in 1982. The market value of Canadian Fish products was nearly $2 billion in 1982. There were 130,000 fishers and plant workers directly employed in Canada's fishery during 1982 and 40,000 fishing vessels were federally registered. However, landings on the Pacific coast decreased by 16 per cent to 140,000 tonnes with a landed value of $237 million, and the market value of fishery products dropped by 12 per cent to $470 million due to a decrease in the production of canned Pacific salmon (Canada, 1983).

4 An individual boat can fish for more than one type of species - thus the reason why there are more licenses than boats.

5 In 1980, the four largest firms processed 82% of canned salmon and 62% of all salmon products. In the past, processing companies have maintained vertical integration: owning their own fleets and renting the boats to fishers who were then obligated to sell their catch to the company; providing ice plants and packer boats; and finally processing and marketing fish products. The trend in the past decade has been for processing companies to dispose of their fleets and focus their activities in processing and marketing (Pearse, 1982).

6 "Harvesting was, and still is, based on the 'rule of capture'; that is, unlike other natural resources, fish in the sea are not assigned through property rights or licences to any particular users; each user competes directly with all the others for a share of the catch, and has not right to any particular quantity until he has landed it." (Pearse,1982:76). Pearse argued that, in these circumstances, temporary profits will stimulate fishers to expand their vessels' fishing capacity in order to increase their catch, and further, will attract new entrants into the fishery. The fleet will expand even if it is already capable of taking the entire harvest. There are several effects from this phenomenon. First, this process threatens the stocks because constraining overexpanded fleets to yield capabilities is difficult. Second, the redundant capacity raises the capital, labour and operating costs involved in fishing, and so erodes the net returns the fishery could otherwise generate. "The scope for carrying the extra costs of surplus capacity is greatest in those fisheries that are capable of yielding the highest returns. Thus, we find the most conspicuous overcapacity in our most valuable fisheries yield low returns in the long run because the effort expended tends to rise, and the costs inevitably increase to the point where they are equal to, or absorbed in, the full value of the harvests." (Pearse, 1982:76) A

third effect of this process is the instability which tends to characterize such fisheries. Any increase in the available catch, or rise in the price of fish, or technological development that lowers the costs of the fishing effort, induces fleet expansion; opposite changes force painful contraction through financial failures. As Pearse notes, this has characterized the history of major fisheries on Canada's Atlantic and Pacific coasts, as well as throughout the Western world.

> "All of these effects - stock depletion, poor economic performance and instability - result from treating the resource (the fish) as common property until they are caught, and are normal whenever resources are treated this way. It is 'The Tragedy of the Commons'. The overexpanded fishing capacity is not the result of irrational behavior on the part of fishermen. When an industry is profitable, the producers will usually expand their productive capacity; and as long as there are no serious barriers to new entrants to the industry, their numbers will grow. But unlike most other industries, such expansion in fisheries takes place even when no additional production is possible. The harvest is simply spread more thinly across the expanded fleet and the cost of fishing is driven upwards." (Pearse, 1982:76)

7 This figure is thought to be representative of the previous five years (Westen, 1979), though it is reasonable to assume that with changes in fish stocks and the economy this figure has since changed. The total direct income to Greater Victoria from commercial fishing, and fish processing was $14,318,000.00. In 1979, the income multiplier associated with commercial fishing and fish processing locally was estimated at 1.48, the employment multiplier at 1.75 (Westen, 1979).

8 Other economic spin offs to the area include the purchase of boats, motors, trailers, recreational vehicles, summer cottages, camping equipment and similar goods which were used in whole or in part for sport fishing (an estimated $14.4 million of which was spent in Greater Victoria in 1978). The total net income

derived from sport fishing in Greater Victoria in 1977-1978 was $18 million (Westen, 1979).

9 Almost two-thirds of all sport anglers fished five days or less, and only fifteen per cent fish more than ten days. Ten percent of the fishers caught more than half of the total catch, while nearly 40 per cent caught no salmon at all (Pearse, 1982).

10 The salmon fishery has, and continues to be, of immense importance to the economic livelihood and cultural tradition of many of Native Indian communities in British Columbia. This thesis's focus emphasizes theoretical issues relating to the application of social psychology to commons dilemmas in general. That the thesis does not specifically address in detail the substantive issues surrounding the importance of the salmon fishery to Native Indian groups in B.C., should not be considered reflective of the relative importance of these issues.

11 Not to mention the ecological imbalance this result would create.

12 It should be noted that only perceptions about communication were measured. Frequency of communication was not measured.

13 Except for item 34 of Appendix A and item 36 of Appendix B; both of which were based on 10 point scales.

14 These discussions were carried out after the questionnaires were completed, while they were being collected.

15 Lists of fishers from which to construct a random sample were impossible to obtain, and the time in which it would be possible to collect data from commercial fishers was extremely limited due to an impending opening.

16 Excluding one individual who stated he/she was a former member.

17 Based on the subjective rating scale employed in the questionnaire.

18 CF refers to a commercial fisher. SF refers to a sport fisher.

19 Commercial fishers who were association members, on average, estimated the percentage chance of being caught more higly (30-40%) if they broke the regulations, relative to non-association members (20-30%) - see Table 3.6.

20 These findings lend support to the hypothesis that network membership influences social evaluations about those involved in the fishery. This finding also complements the work of Lynn and Oldenquist (1986), and Messick and Brewer (1983) who argue that cooperative behavior in social/commons dilemmas can be enhanced by group-egoistic motives. Association members have a certain number of common interests. One of them, if they are to continue engaging in the livelihood of salmon fishing, would be in the preservation of salmon stocks. Although non-association members would, in general, have the same common interests as association members, association members may develop stronger conservation-oriented attitudes through the social comparison processes and information exchange made possible by the social ties that develop through group interaction.

21 In addition, a person probably has to have some degree of success before making the commitment to join a fishing association. Objectively, association members were more successful in terms of the number of fish they caught.

22 Association members might have been more likely to perceive that the D.F.O. is "cranking up the heat" in its attempts to conserve salmon stocks. They may have perceived government pressure to follow the regulations to be substantially greater than societal pressure. Non-members may not have been perceptive of the differences in intensity between these two sources of social

pressure, and therefore perceived societal pressure to be relatively greater.

23 One possible solution to this problem, it would seem, would be to sell licenses for certain numbers of fish, but keep the total harvest at a set limit. For instance a fisher could purchase a license for 20 chinooks, while another (who fishes only a couple of days a year) might purchase one for only 4 chinook salmon a year.

24 Messick and Sentis (1983:61) state: "The comparison of one's outcomes, achievements, opinions, and characteristics with those of others influences one's assessments of satisfaction with oneself. Further, these comparisons influence one's beliefs about the fairness or justice of the differences that one discovers through the process of comparison. One's degree of satisfaction with a comparison may influence or may be influenced by one's own judgment of fairness."

25 From 20 chinook to 8. At the time the study was conducted, the previous limit had been 30. At a recent meeting I attended between the D.F.O. and sport fishers, though, the largest howls of protest were sounded against seiners.

26 There are some further ways in which inexperienced fishers pose a greater threat to the resource - one being the fact that they are more likely to kill or severely damage immature fish when attempting to release them.

Chapter 4

STUDY 2: A LABORATORY SIMULATION OF A COMMONS DILEMMA

Background

This study employed a computerized simulation of "the commons dilemma game" (see Edney, 1979; Gifford, 1982). The procedure involved groups of 3 subjects who "fished" for computer-animated fish, which could be later exchanged for money.

As with the field study, this study was exploratory in nature. Its purpose was to examine the relations between a number of social psychological variables, including social identity and social class, and resource behavior in a simulated commons. A number of the same social psychological variables were included in the design of both studies. Further, the lab study extends the research process by examining objectively measured resource behavior. Thus, some speculative inferences may be drawn from the lab to naturalistic settings.

The social psychological variables of interest were derived from the field-survey, the commons dilemma literature, and related social psychology literature. Variables pertaining to the following concepts were examined: attitudes and social values, distributive justice, free riding, limited cognitive processing, payoffs, social identity, trust, attributions, and social class. As outlined earlier in the thesis, these variables are not only implicated in commons dilemmas, but are

also subject to social network influences. (These will be discussed in greater detail below.) Thus, although no specific network measures were included in the design of this study, social network effects were probably indirectly involved in determining the pattern of results observed in the simulation.

"Efficiency of resource behavior" is a concept that will be employed throughout this chapter. Essentially this concept refers to an individual's ability to harvest a resource in such a manner that a balance is struck between receiving a maximum yield and maintaining a healthy stock of the resource (by taking into account the likely harvest of others, and the regeneration rate of the resource). Admitedly, this is a somewhat idealized concept and would be difficult to measure outside of the laboratory. It is, however, a useful concept for the task at hand.

The subjective measures in this study will be described below. These were obtained from responses to a post-experiment questionnaire. The questionnaire items can be viewed in Appendix C.

Variables and Hypotheses

Group Membership and Social Identity

As discussed earlier, social identity is the aspect of self identity that relates the individual to a social group. Social identity influences the individual's actions in the context of group outcomes. In naturalistic settings, networks play an important role in this process. The location of an individual in a social network, and the strength of his/her ties to other network members probably influences his/her social identity. Social identity influences an individual's orientation in collective dilemma situations. The strength of identification one feels with a social

group increases the likelihood of that individual acting in accordance with group interests. Thus, when social dilemmas arise, social identity can alter the nature of the payoff matrix. In such instances, group interests become rational.

In accordance with the findings on social group identity and resource behavior in commons dilemmas (Messick and Brewer, 1983; Brewer and Kramer, 1986; Lynn and Oldenquist, 1986), I surmized that the more an individual identified him or herself as a group member, the more efficient his/her resource harvesting behavior would be. Social identity was measured by asking subjects whether in playing the game they thought of themselves as individuals or as members of a group. It was hypothesized that social identity (thinking of oneself as a group member) would be positively correlated with efficient resource harvesting behavior.

Social Class

Based on brief references to class and inequality in theoretical discussions of the commons problem (see Edney, 1981), the social class background of resource harvesters would seem to be an important factor in commons dilemmas. Social class has not, however, been examined empirically by social psychological perspectives within the commons dilemma paradigm. Thus, in the present study, it was undertaken to explore the relation between social class background and resource behavior.

Wright's work on class consciousness (Wright, 1982a, 1982b, 1983, 1984, 1985) demonstrates the relations between social structure, attitudes, and class identification. Wright observes that class locations defined by exploitation relations objectively structure class interests and attitudes.[1]

Wright has conducted several cross-national surveys. His analysis of social class is based, in part, on ego-centered network data. For instance, in a survey of Swedes, he found that class biography variables, such as working class networks, are a substantial force in shaping class consciousness.[2]

The present study examined the effects of social class background. Class background was based on the social class location of subjects' parents. Parental class is determined by social relations with others, including social interactions in work-related social networks. Children's class experiences are probably learned to some extent through interactions in family networks; for instance, through interactions with parents' friends and co-workers. In the present study it was conjectured that people's attitudes and behavior are influenced in part through socialization in the context of the family, and in family networks which have some class basis.[3]

Subjects were classified on the basis of their parents' social class location using Wright et al.'s (1982) typology. In this typology classes are not defined in terms of categories of occupations, (a practice which Wright argues can be extremely misleading), but rather in terms of the social relations of control over investments, decision making, other people's work, and one's own work.

> Most sociological discussions of class either explicitly or implicitly view classes as essentially aggregations of occupational categories. Even where they disagree on the conceptual content of the concept of class, they agree that operationally classes can be defined as groups of occupations.
>
> Marxists generally reject this conceptual conflation of class and occupation and insist that these two concepts designate qualitatively distinct dimensions of the social organization of work. Occupation broadly designates the technical content of jobs: class designates the social relations of domination and appropriation within which those technical activities are performed. (Wright et al., 1982:718-719)

As noted, social class background was based on the social class location of the subjects' mothers and fathers. These were derived by analysing the descriptions provided by subjects about who each of their parents worked for, and what they did. These descriptions were analysed and coded using the classification scheme depicted in Table 4.1 (where this information was available).

Table 4.1: Logic of Classification Scheme for Social Class Background

Class Location	Self Employed /owned business	# of others in workplace	Authority over others	Self Auton.	Type of Class Location
Bourgeoisie	yes	> 10 (large)	yes (high)	n.a.	Basic C.L.
Managers	no	n.a. (high)	yes	n.a.	Contrad. C.L.
Supervisors	no	n.a. (low-moderate)	yes	n.a.	Contrad. C.L.
Worker	no	n.a.	n.a.	low	Basic C.L.
Semiautonomous Employees	no	n.a. (if yes-low)	no	high	Contrad. C.L.
Petty Bourgeoisie	yes	n.a.	no	n.a.	Basic C.L.
Small Employers	yes	< 10	yes/ high	n.a.	Contrad. C.L.

Table 4.1 (continued)

Class Location	Self Employed /owned business	# of others in workplace	Author. over others	Self Auton.	Type of Class Location
Homemaker	n.a.	n.a.	n.a.	n.a.	Non-C.L.
Non-Class Location (other than homemaker)	na.	na.	na.	na.	Non-C.L.
Not enough information for classifcation	n.a.	n.a.	n.a.	n.a.	Non-C.L.

Obviously, the measures used for determining social class location are much less precise than those employed by Wright et al. (1982). Although the methodology is different, the present analysis is based on the same logic outlined by Wright et al. (1982).[4]

> This strategy is based on a distinction between three kinds of locations within a class structure: basic class locations, contradictory locations within a mode of production, and contradictory locations between modes of production. (Wright et al., 1982:710).

As this was an exploratory study and a number of other variables were also being investigated, the present methodology was adopted in the interest of expediency. A brief description as to how subjects' descriptions were analysed, and classified into different class (and non-class) location categories, is presented in Appendix D.

It was predicted that there would be a relationship between subjects' social class background and their resource behavior. More precisely, it was predicted that there would be differences in the average amount of "fish" people took, depending on their social class background. In further specifying the relationship between social class and resource behavior, it was conjectured that those subjects who came from social class backgrounds depicting greater autonomy and power would expect to receive greater proportions of the resource, and individual interest would play a greater part in their resource behavior. In contrast, it was predicted that those subjects who came from social class backgrounds depicting less autonomy and power would expect to receive equal or less proportions relative to the other players, and individual interest would play a lesser part in their resource behavior. Therefore, it was predicted that those subjects who came from social class backgrounds depicted by greater power (as defined by their parents' work relations), would be more inefficient in their resource behavior.

Material Payoffs

The payoff structure and the value of the resource to individuals, are two important predictors of resource behavior. In the present study, subjects were asked how important the potential monetary reward was to them. However, as outlined above, social values such as equality, can alter the payoff matrix in a commons dilemma. Further, identifying with a social group can also alter one's conceptions about what rational action entails. In such instances group-oriented action can become more important than self-interested actions. It was predicted that as people increasingly valued the monetary reward, their resource behavior would become increasingly "inefficient". In addition, the relation between people's reported value for the monetary reward, and whether they thought of themselves more as individuals or as group members was explored.

Attitudes and Values

As outlined earlier, social networks are important facilitators of attitude formation and change (see Erickson, 1982). The present study focused on the relations between a number of specific attitudes (discussed below) and resource behavior.

Freedom vs. Equality

As noted earlier, the problem of freedom versus equality with regard to limited shared resources is a central issue of the commons problem (see Hardin, 1968; Edney, 1981). In the simulation study it was hypothesized that having a stronger belief in equality than freedom would be related to individuals behaving cooperatively, while a stronger belief in freedom than equality would correspond with people behaving competitively in the present commons dilemma scenario.

Subjects' attitudes on this dimension, their relative value for freedom vs. equality, were measured by asking them whether in playing the game they thought they should try to catch as many fish as desired or take only their own (equal) share of fish. It was predicted that valuing equality over freedom[5] would be positively correlated with efficiency of resource behavior.

Political Attitudes

As elaborated above, in the present study it was predicted that people who thought of themselves more as group members than as individuals, would engage in more efficient resource behavior. It was also conjectured that people who placed a higher value on equality than freedom, would be better resource managers. In the field-survey study it was observed that the more intensely freedom was valued over equality by fishers, the more intensely free enterprise tended to be valued over socialism.[6] Thus, extending these findings, in the present study it was additionally hypothesized that there would be a correspondence between an individual's political attitude and his/her resource management behavior.

Subjects were asked to indicate their political attitudes. It was predicted that those who identified their political attitudes as "socialist" would be more efficient resource managers than those who identified themselves as "liberals", who in turn would be more efficient than those who identified themselves as "conservatives". This hypothesis was based on stereotypes about the positions these different political philosophies take, especially with regard to economic matters (e.g., public versus private enterprise) in proclaiming the virtues of collectivism and equality at one end of the spectrum (socialism) to proclaiming the virtues of individualism and

freedom at the other end (conservatism; with liberalism situated somewhere in between).

Underlying this question was the assumption that political groups can serve as reference groups for individuals with regard to resource relevant behavior. Implicitly, this question sought to test whether there is a correspondence between one's affiliation for a particular "political group" and whether individuals appear to use that group's standards to guide their own resource behavior.

Understanding of the Dilemma

As discussed in Chapter 2, one explanation that has been put forward to explain commons dilemmas is people's limited ability to accurately process complex social information. Networks, however, can counter the effects of limited cognitive processing capacities by enhancing understanding of such dilemma situations. Social networks can act to increase the visibility of other individuals' actions in the commons and, further, serve as a conduit through which information about the resource can flow. One purpose of the simulation was to explore the influence of limited cognitive processing on behavior in the commons. Thus in accordance with "limited cognitive processing theory" (Dawes, 1980), it was predicted that those subjects who understood the principles of the simulation better, would be better resource managers in the simulated commons. One measure of this variable was obtained by asking subjects how well they felt they understood the principles of the game. It was predicted that understanding the dilemma would be positively correlated with efficiency of resource behavior. One dimension of understanding the dilemma is understanding that outcomes are neither random nor fatalistic, that is, the perception that people make choices

which have a significant impact on the state of the resource. To measure this, subjects were asked whether they perceived their performance, and the performance of the other players as influencing the outcome of the game. It was predicted that "self's influence" would be positively correlated with efficiency of resource behavior. It was predicted that others' influence would also be positively correlated with efficiency of resource behavior.

Trust

Based on the largely theoretical literature (e.g., Edney, 1981) discussing trust in social/commons dilemmas, it was hypothesized that the more an individual trusts the other individuals participating in the simulated commons, the more likely that individual is to engage in efficient resource management behavior, (i.e., will harvest more "fish" overall, yet leave the resource in a healthy state). Thus it was predicted that trust would be positively correlated with efficient resource behavior.

Based on the research of Yamagishi and Sato (1986), on the motivations for uncooperative behavior in public goods scenarios, subjects were asked to rate how "greedy" (greed) they were, and also how "worried" (fear) they were that other players would take more than their fair share.

Although the present simulation involved a commons dilemma rather than a public goods scenario, these situational and motivational factors should presumably be of importance to cooperation in the commons, and hence to the fitness of limited shared resources. In the simulated commons, the resource can be thought of as being "conjunctively" reproduced. That is, the resource's survival depends on the entire group leaving at least some fish. It depends on the actions of the least cooperative member - that he or she leave at least some "fish". In

accordance with Yamagishi and Sato's study it was expected there would be a correlation between subjects' resource behavior and their reporting being "worried", as this was a conjunctively reproduced resource. It was hypothesized that being worried that others would take more than their share, would be positively correlated with inefficient resource behavior. No significant correlation was expected between "greediness" and resource behavior. The relations between these two variables, "worriedness" and "greediness", and social identity were also explored.

Justice Evaluations

One of the questionnaire items dealt with aspects of distributive justice theory. Subjects were asked how fair or unfair they were in playing the game. This question dealt only with the subjects' perception of justice, not their subsequent behavior. It was predicted that the more efficient an individual was in his/her resource behavior, the more likely he/she would be to evaluate his/her behavior as "fair".

Attributions About Self and Others' Resource Harvesting Behavior

As touched upon earlier, how people think about themselves, and others, in commons dilemma situations can influence their subsequent behavior. This study sought to explore the relation between people's attributions, about self and others, and their resource behavior. To this end subjects were asked whether or not they/others were trying to cooperate. Subjects were also asked if they/others played the way that they did because of the situation they/others were in, or because of their own/others independent intentions, etc. (see Experimental

Sessions subsection of the Research Design and Methodology section). A common observation in laboratory simulations of commons dilemmas is that subjects often get quite involved (e.g., Dawes, McTavish, and Shaklee, 1977). Another finding, is that there is often a lack of cooperation on the part of participants in these commons dilemma simulations. This latter outcome is almost expected because it is a rational way for individuals to behave. An important issue that has not been adequately examined, however, is what people think they are doing in these situations.[7] One intention of this research was to examine what people actually thought about their own, and others' behavior in a simulated commons dilemma. These attributions would then be contrasted with categorizations of objective behavior recorded during the laboratory simulation. The present analysis will focus on the relation between the social class background and political identification of subjects and their self-perceptions about cooperativeness.

Resource Harvesting

People's resource behavior was recorded directly onto a computer disk during the simulation. This procedure will be elaborated in the Research Design and Methodology section. A number of behavioral measures were calculated based on these data. These measures will be discussed further, after the structure of the simulation is described.

Research Design and Methodology

Subjects

The subjects in this study were 93 undergraduate subjects drawn from a third year psychology course at the University of Victoria.

Apparatus

The apparatus used in the simulation consisted of an "Apple II plus" micro computer, and attached to it, three game buttons. The software used was "The Commons Dilemma Computer Game" computer program. Additionally there were two partitions adjacent to the computer monitor, preventing subjects from seeing one another, but allowing them to see the monitor. Classical music (The Best of Bach, C.B.S.) was played during the experiment to mask the sound of the game buttons. Subjects were told that the music was not part of the experiment but merely served the forementioned purpose.

Procedure

Instructions and Practice Sessions

As subjects arrived at the lab, they were met by the experimenter who explained that they would be participating in a simulation experiment with two other persons. The experimenter then provided subjects with the following verbal instructions:

> This is a simulation experiment where you will be pretending to be a fisherman/woman. When you begin there will be 12 animated fish "swimming" on the computer screen. The object of the simulation is to catch fish.
>
> The way you catch fish is by pushing down on the buttons. When you press your button, make sure you press it all the way

down, let it come all the way back up, and do not press it more than once a second. Each time you push down on your button you will catch one fish. There is no trick to catching fish, you do not have to use a hook or anything like that. Simply, each time you press your button down you will catch a fish. the computer keeps track of the number of fish you catch.

The computer will beep once to signal the beginning of a trial. Once it beeps, you will have approximately 15 seconds in which to catch fish. At the end of the trial the computer will beep twice.

At the beginning of the first trial there will be 12 fish in the "ocean". Like in the real world, when there are fish left over from an expedition (or in this case a trial) the remaining fish will reproduce. At the beginning of the next trial (and subsequent trials) the computer will double the number of fish that are left over from the previous trial, to a maximum of 12 fish. After a brief interlude you will be able to fish again. If however, there are no fish left over in the ocean at the end of a trial, the fish stock will be unable to regenerate, and the simulation will be over - just like in the real world when a species becomes extinct.

The object of the simulation is to pretend you are a real fisherman/woman who earns a living by fishing. For the experimental session you will be paid 10 cents for each fish you catch. You will be given real money, not symbolic money.

In catching fish, you may devise your own strategy (rate) of harvesting. You may catch a large number in a short period of time and try to make money quickly, or you may take fewer fish, over a longer period of time, and try to make more money in the long run. However, if you take all the fish, the resource will be extinguished, and the session will be over.

The subjects were then shown a demonstration version of the game, with the animated fish swimming on the screen. The experimenter "caught" fish for one or two trials, and then allowed subjects to "catch" fish for one or two trials, until they appeared to understand the instructions. The experimenter then gave the following instructions:

During the practice version of the game you could see how many fish there were, while fishing. During the simulation version the screen will go blank while you are fishing. You will be able to tell how many fish there are before you begin, and at the end of the trial, but you will not be able to see the fish while you are actually fishing.

> Also, during the practice version, the computer displayed the individual participants' scores. In the simulation version you will find out how many fish the group took in total at the end of each trial, but not how many each individual took. At the end of the simulation the computer will display final individual totals. Remember, you will catch one fish each time you push down your button (providing there are fish in the ocean).

The subjects were then shown a second practice version of the game. Again, the experimenter "caught" fish for one or two trials, and then allowed subjects to "catch" fish for one or two trials, until they appeared to understand the instructions (again, they were asked if they had any questions about the instructions). The subjects were told that for the second practice session, and the experimental session, the buttons must be kept hidden (their hands must remain behind the partitions). Subjects were also informed that during the experimental session they would be asked to answer a few questions after each trial, and that they should remember how many fish were taken.

Experimental Sessions

Session #1

The start of each trial was controlled by the experimenter by typing a password into the computer keyboard. When a trial began, subjects would "fish" for approximately 15 seconds. The experimenter would then read out loud (from the screen at the end of each trial) the number of fish the group had taken during the trial, and the number that would be in the "ocean" on the next trial. The subjects would then answer (with a pencil and paper, behind the partition) four questions about their behavior, and the behavior of others, during the previous trial. They were asked two questions about themselves. The first question was:

"Were you; a) trying to cooperate (i.e., preserve the number of fish), or b) not trying to cooperate, or c) neither of the above." The second question asked: "Did you play the way you did because of: a) the situation you were in, or b) because of your own independent intentions, desires, etc., without regard for how the others played, or c) neither of the above. Subjects were also asked the same questions about the behavior of the-other-players as a group (since they did not know how many fish the others took individually).[8] The experimenter would ask if everyone had finished answering the question, and when they had he would begin the next trial.

Session #2

If the subjects extinguished "the resource" on or before 7 trials, they were told:

> Because you extinguished the resource so early, you will be given another chance. There will be one more session (of trials). Again, you may use your own strategy for catching fish - (for example) you may catch many in a short period of time, or fewer in each trial over a longer period of time, but if you want to keep fishing and earning money, you have to leave some fish.

Subjects who did not wipe out the resource on, or before, the 7th trial were merely told (after the 1st session of seven trials had been completed) that they would now be participating in a second session. No subjects were told the number of trials in a session.[9]

At the end of the second session (after the subjects had finished answering the attribution questions), session totals, and grand totals of fish taken, were displayed on the computer monitor. The experimenter then wrote down on a slip of paper, the amount of money each participant was entitled to based on the

number of fish they took; and an assistant led subjects to an adjacent room to answer a questionnaire about the experiment. While subjects began filling out the questionnaire, the assistant would pay them cash for the amount specified on the slip of paper each had received.

Behavioral Measures

From the data recorded onto floppy disk, a new behavioral measure was devised for the present study, the "Observed-Ideal Difference Index Score" or OIDXS, which measures the average difference per trial between an individual's observed strategy and an ideal resource managment strategy.[10]

Frequencies of Cooperation and Defection

OIDXS is a measure of the relative amount of the resource an individual harvested. A somewhat different set of measures are the relative frequencies of cooperative versus defective behaviors individuals engaged in, across trials. These measures were also calculated from the computer recorded data, and have been categorized in three different ways. One categorization, share, was based on whether subjects simply shared what fish were there at the start of a trial. Any time a subject took more than one-third of the fish, his/her behavior was categorized as defective. Any harvest of one-third or less was defined as cooperative. This strategy is not an effective one from a resource management standpoint, but may be the level on which many people operate with regard to the attributions they make about behavior in commons dilemmas.

The second scheme for categorizing behavior, status quo, was based on whether an individual harvest served to maintain the resource at its current level.

Since there were three people fishing, and since the computer doubled the number of fish that remained after each trial (up to a maximum of 12), any individual harvest of one-sixth, or less than one-sixth, of what was there at the start of a trial would preserve the status quo. Such harvests were defined as cooperative. A defecting behavior occurred whenever a subject took more than one-sixth of what was there at the start of a trial.

The third way of categorizing harvest behaviors was based on the optimal resource management strategy, "ideal world". Since there were 12 fish at the start of the first trial, the ideal strategy on that trial would have been for each person to take two fish. Six fish would have remained, the computer would have then doubled this number, and there would be a full 12 fish for the next trial from which two could be taken by each player, etc..[11] Theoretically, "fishing" could have gone on indefinitely and all subjects would have made money while preserving the resource. Therefore, in this categorization scheme, if there were 12 fish at the start of a trial, defection occurred if a person took more than two fish; when there were nine to eleven fish at the start of a trial, defection occurred when a person took more than one fish; and if there were less than nine at the start of a trial, any harvest at all was defective.

Methods of Data Collection

There are three sources of data: 1) the computer recorded subjects' "harvesting behavior" (i.e., how many times they pushed a button which allowed them to "catch" computer animated fish) and stored these data directly onto a floppy disk; 2) a series of structured questionnaires completed by subjects, and

consisting of multiple choice responses, bi-polar rating scale items, and open ended questions (see Appendix C); and 3) lab notes compiled by the researcher based on observations recorded during, and immediately following, the simulation sessions.

Sampling Procedure

A convenience sample was used in this study. The subjects were 93 students from a third year undergraduate psychology class at the University of Victoria, who participated in the experiment in partial fulfillment of a course requirement. Three subjects were asked to sign up to form a group for each session.

Again as this was a nonprobability sample it suffers from the weaknesses inherent in this type of sampling as described in the previous chapter. In particular, the researcher is limited from generalizing the observed findings from the specific sample studied, although this is routinely done in experimental social psychology.

Types of Data Collected

There were five types of data collected: 1) quantitative behavioral (interval) data; 2) quantitative subjective (interval) data from the responses to the structured bipolar interval scale questionnaire items; 3) quantitative nominal data from responses to questions about people's attributions; 4) nominal data from political attitude and social class questionnaire items; and 5) and qualitative data from the experimenter's notes.

Summary of Research Design and Methodology

In summary, the research design employed in this study was a laboratory game simulation with a follow-up questionnaire. The control involved in this type of methodology is a strength. A potential weakness is the artificiality of the laboratory environment. Because of the use of a nonprobability sample, and the problems associated with laboratory research, generalizability of this study's findings will be limited.

Results

As noted earlier, a post experiment questionnaire was administered to subjects, asking them to rate on bipolar scales, their evaluations, attitudes, and perceptions about the performance of themselves, and others during the simulation. Additionally, subjects were asked to rate their political attitudes, and to describe their parents' occupations during their youth.

Listed in Table 4.2 are the means and standard deviations of the behavioral measure (OIDXS - observed ideal difference index score), and the bi-polar subjective measures. OIDXS refers to an individual's average harvest of fish per trial. A positive score for OIDXS indicates overfishing, a negative score indicates underfishing, and a score of zero indicates a perfect resource harvesting strategy. The bi-polar subjective measures were based on nine-point scales. The relations between social class, political attitudes, attributions, and resource behavior will be examined latter in this section.

Table 4.2: Means, S.D., & N. for Rating Scale Items[1] and OIDXS

Variable	Mean	S.D.	N.
OIDXS	.69	.94	93
Freedom vs. Equality	7.2	2.25	91
Fairness of self	3.92	2.30	93
Fairness of others	3.93	2.23	92
Greediness	3.56	2.39	93
Influence of others	6.51	1.60	92
Influence of self	6.07	1.73	92
Importance of money	2.98	1.93	93
Social identity	6.73	2.45	92
Trust	3.91	2.05	92
Understanding	7.35	1.68	91
Worried	3.78	2.23	93

1. Rating scale items range from 1.00 to 9.00 (see Appendix C).

Table 4.3 lists the intercorrelations between OIDXS, social identity, and the rest of the subjective rating scale measures. Intercorrelations between the subjective scale items are presented in Table 4.4. On average, people participating in the simulation, thought of themselves more as group members than as individuals. The more that people thought of themselves as individuals (as opposed to group members) the more they tended to overfish ($r = -.39$).

Table 4.3: Correlations

Between OIDXS, Social Identity and Other Rating Scale Items[1]

Variable	OIDXS			Social Identity		
	r	r2	p. <	r	r2	p. <
OIDXS	-	-	-	-.39	.15	**** (2)
Freedom vs. Equality	-.43	.18	**** (2)	.49	.24	****
Fairness of Self	.41	.17	**** (2)	-.25	.06	*
Fairness of Others	-.23	.05	*	.05	.00	-
Greedy	.58	.34	**** (2)	-.33	.11	***
Influence of Others	-.32	.10	*** (2)	.27	.07	*
Influence of Self	-.19	.04	* (2)	.10	.01	-
Importance of Money	.13	.02	- (2)	.07	.00	-
Social Identity	-.39	.15	****	-	-	-
Trust	-.13	.02	- (2)	-.08	.01	-
Understanding	-.38	.14	****	.33	.11	***
Worried	-.09	.01	- (2)	-.05	.00	-

* p. < .05
** p. < .01
*** p. < .005
**** p. < .0001

1. Possible values for the rating scale items range from 1.00 to 9.00.

2. Indicates one tail test

Table 4.4: Intercorrelations of Rating Scale Items

Variable	1	2	3	4	5
1. Freedom vs. Equality	1.00	-.47 ****	.16	-.69 ****	.11
2. Fairness of Self	-.47 ****	1.00	.05	.58 ****	-.19
3. Fairness of Others	.16	.05	1.00	-.32 ***	.22 *
4. Greedy	-.69 ****	.58 ****	-.32 ***	1.00	-.13
5. Influence of Others	.11	-.19	.22 *	-.13	1.00
6. Influence of Self	.11	-.08	-.12	-.01 **	.27
7. Importance of Money	-.03	.06	-.00	.07	.15
8. Trust	-.11	.16	.38 ****	-.05	.01
9. Understanding	.34 ***	-.32 ***	-.03	-.34 ***	.27 *
10.Worried	.09	-.08	.45 ****	-.12	.28 **

* p. < .05
** p. < .01
*** p. < .005
**** p. < .0001

Table 4.4 (continued)

Variable	6	7	8	9	10
1. Freedom vs. Equality	.11 -	-.03 -	-.11 -	.34 ***	.09 -
2. Fairness of Self	-.08 -	.06 -	.16 -	-.32 ***	-.08 -
3. Fairness of Others	-.12 -	-.00 -	.38 ****	-.03 -	.45 ****
4. Greedy	.01 -	.06 -	-.05 -	-.34 ***	-.12 -
5. Influence of Others	.27 **	.15 -	.01 -	.27 *	.28 **
6. Influence of Self	1.00 -	-.01 -	-.00 -	.21 -	.11 -
7. Importance of Money	-.01 -	1.00 -	02 -	08 -	33 ***
8. Trust	-.00 -	.02 -	1.00 -	-.05 -	.31 ***
9. Understanding	.21 -	.08 -	-.05 -	1.00 -	.12 -
10.Worried	.11 -	.33 ***	.31 ***	.12 -	1.00 -

* p. < .05
** p. < .01
*** p. < .005
**** p. < .0001

The more that people identified themselves as group members, the more likely they were to: 1) feel they understood the principles of the simulation ($r = .33$); 2) perceive that others' performance influenced the outcome of the game ($r = .27$); 3) evaluate their own behavior as being fair ($r = -.25$); 4) value taking only their own (equal) share of fish ($r = .49$); and 5) indicate they were not "greedy" in taking fish ($r = -.33$).

The following subjective variables were not substantially correlated with "social identity": "importance of money", "the perception that self's behavior influenced the outcome of the simulation", "trust that others would cooperate", and "being worried that others would take more than their fair share" (see Table 4.3). These latter findings were unexpected, in that increased social identity should be positively correlated with trust, and negatively correlated with "worried".

As noted, OIDXS is an objective measure of the efficiency of people's resource harvesting behavior; a perfect score on this measure would equal zero, while a positive score indicates "overfishing" and a negative score indicates "underfishing". Although, on average, most people overfished: 1) people who understood the game better, overfished less ($r = -.38$); 2) people who perceived that their performance influenced the outcome of the game, overfished less ($r = -.19$); 3) people who perceived that others' performance influenced the outcome of the game, overfished less ($r = -.32$); 4) people who overfished less were more likely to evaluate their own behavior as being fair ($r = .41$); 5) people who thought that they should try to catch as many fish as desired, rather than only their own (equal) share tended to overfish more ($r = -.43$); and 6) the more greedy that people rated themselves, the more they overfished ($r = .58$).

The following subjective variables were not significantly correlated (using simple correlation) with resource harvesting behavior: "trust that others would cooperate", "importance of money", or "being worried that others would take more than their fair share" (see Table 4.3).

The validity of laboratory game research into social and commons dilemmas has been questioned by some, but as noted earlier (Dawes, McTavish and Shaklee, 1977), behavior that has been observed in such experiments often resembles that of which one expect to find in the real world. Similar observations were recorded during the present simulation. Many subjects displayed controlled emotional outbursts before filling out the post experiment questionnaires, especially when a great deal of inequality in harvesting occurred. Below are some of the comments made by subjects to others at the end of the simulation:

> "How could you take 36 fish!"
>
> "You greedy pig!"
>
> "Now don't you feel guilty?"
>
> One subject replied, "I didn't take more for the money."
>
> In one group the person who took the least number of fish said to the person who took the most: "you need an economics course." "you die, NAME"
>
> Later this same person said to the experimenter, "that's pretty clever, I wrote down a lot of things ... I could have smashed some heads."

Social Identity

As discussed above, in the simulation it was observed that those individuals who thought of themselves more as group members than as individuals, engaged in more efficient resource harvesting behavior. Social identity was also related to understanding the dilemma, self evaluation about resource behavior, attitudes regarding freedom vs. equality, and motivations for resource behavior. These findings are generally supportive of the notion that the strength of people's group identification is related to their resource behavior in some circumstances; and correspond with the findings of Messick and Brewer (1983), and Brewer and Krammer (1986), on the relation between social identity and cooperative behavior in social/commons dilemmas.

Although no specific network measures were employed in the study, these findings also complement the network theme of the thesis and suggest an avenue for future research. Structural location is a factor in determining the strength of social identity. Future research on this problem should explore social identity in the context of networks.

Material Payoffs

In the present commons dilemma scenario social utilities such as social identity seemed to be more important than "material payoffs" such as the money paid to subjects. This finding supports the idea that social forces can alter the nature of the payoff matrix in some circumstances - so that choices in the commons no longer present a dilemma to the individual. It should be noted that the direction of the correlation between "the importance of money" (to subjects) and resource behavior, though not statistically significant, was as predicted. The

more intensely individuals valued the potential monetary reward, the more they tended to overfish. Perhaps if increased amounts of money were to be allocated in the simulation, this relation would be stronger, and the relation between resource behavior and some of the other social psychological variables would be altered. These results do indicate, though, that social utilities can be important in guiding people's resource behavior.

Freedom versus Equality

The hypothesis that those who value equality over freedom will be more efficient resource harvesters, was borne out by the present findings. Those subjects who felt they should take only their own (equal) share of "fish" rather than try to catch as many "fish" as possible, engaged in more efficient resource harvesting behavior. This result supports Krammer et al.'s (1986) finding that social values can influence people's conservation behavior in commons dilemmas. The interpersonal networks of subjects likely influenced their orientations with regard to these social values. Family, friendship, and university-based networks may have been implicated here. This is an interesting finding in that this specific issue has not been previously examined, and yet is of relevance to Hardin's original (1968) discussion of freedom and morality in commons dilemmas. The ideology of commons dilemmas has not been examined sufficiently in past research, particularly the systematic examination of the relative value people hold for concepts such as equality and freedom, and the relation of these beliefs to behavior in commons dilemmas. Social networks play an important role in the formation of ideologies and belief systems (Erickson, 1982). These findings suggest that this is a potential issue for future network research to explore.

Understanding the Dilemma

The results of this experiment support Dawes' "limited cognitive processing theory" - that people sometimes do not cooperate in commons dilemmas because they do not fully understand the social dynamics of the situation. Those who understood the simulation better, and who understood that their actions and the actions of others influenced the outcome of the simulation, engaged in more efficient resource harvesting behavior. These latter two findings also suggest that there is a relation between behavior in commons dilemmas and learned helplessness (Seligman, 1975) - an avenue of inquiry that could be more fully explored.

Experience and cognitive ability would appear to interact to some degree in determining people's understanding of commons dilemmas. These observations would seem to accord with Krammer et al.'s (1986) results, which suggest the potential value of an individual differences approach to social dilemma research.[12] This finding underscores the importance of information in social/commons dilemmas. In particular, the effects of network-based information should be explored in future research.

Justice Evaluations

In the present study it was observed that people who were more efficient resource managers were more likely to rate themselves as fair. Conversely, the more inefficiently people behaved, they more likely the were to perceive their behavior as unfair. This finding's relevance for equity theory is that there was a correspondence between people's perceptions of fairness and their acting fairly.[13]

The more efficient people were in their harvesting, the more likely they were to perceive others as unfair. The significance of this result is unclear at present. To make sense of this finding in terms of equity theory, the relation between others' behavior and perceptions about others' fairness would need to be calculated. Unfortunately, OIDXS scores were not determined for "others".[14]

There was a correspondence between favoring equality in resource harvesting and evaluating one's own behavior as fair. Thus, it would appear that subjects used the social value of equality as the criteria for evaluating fairness. This was probably due to the structure of the simulation. For instance, people had identical "inputs" and, thus, expected equal rewards. Another factor that probably influenced this outcome, is the importance of egalitarianism in the contemporary university milieu. Again, university-based interpersonal networks likely played a role in influencing the standards the people employed in evaluating fairness in this situation. These findings lend some support to the validity of equity theory as an explanation for behavior in commons situations. In naturalistic commons settings, network processes that influence distributive justice evaluations should be explored.

Trust

The findings regarding the variable "trust" are somewhat mixed. It was expected that there would be a significant relation between a subject's trust that other participants would behave cooperatively, and the subject's own behavior. The present analysis found no substantial correlation between subjects' trust that others would cooperate, and their own resource harvesting behavior.

The present findings regarding greed versus fear in the simulated commons dilemma were exactly the opposite of those predicted based on Yamagishi and Sato's (1986) research. There was no substantial correlation between subjects' reporting they were worried ("fearful") that others would take more than their fair share and subjects' own resource harvesting behavior. There was, however, a substantial correlation between people's resource harvesting behavior and their ratings of self-greediness. The more inefficient people were in terms of resource harvesting (OIDXS), the more likely they were to rate themselves as greedy. Fear of others taking more than their share - or fear of being taken for a sucker - is obviously another measure of trust. Thus, the low correlation between this variable and behavior, is consistent with that observed for "trust" (as noted above). "Greediness" corresponds to "free riding". The present simulation was structured so that the visibility of participants was extremely low. As sanctions or even moral suasion could not be applied towards defectors during the course of the simulation, it is not surprising that the motive to free ride was a factor in the present pattern of results. These findings seem to to contradict Yamagishi and Sato's findings regarding conjunctively (re)produced goods. They have noted, however, in their (1986) article that the "pattern was not observed in cases in which group members knew each other well and expected to discuss their decisions." (1986:72) This may also explain the present experiment's seemingly contradictory results. Perhaps because the subjects in this study were classmates there was not enough variability in their "trust" of each other. Friendship networks amongst the subjects in this study likely influenced this result. Another probable reason that a stronger relationship was not observed between trust and resource

behavior, was the relatively low importance placed on the monetary reward by subjects in this study. If less trivial monetary rewards were offered, trust would likely have been a more important factor in determining resource behavior.

Perceptions about fairness are another factor involved in the production of trust and cooperation in social systems such as commons. In the present study, an inverse relationship was observed between rating others as fair and being worried that they would take more than their share of fish. As noted, social comparisons in the context of interpersonal networks, play an important role in such systems.

Social Class, Attributions, and Behavior

Attributions about Cooperativeness

In Table 4.5 the frequencies and percentages of subjects' self-attributions about their own cooperativeness (made at the end of each trial) during the simulation are displayed. Of self-attributions, in total, 85% of the time people perceived they were cooperating, while 10% of the time they said they were not cooperating. Six per cent of attributions were neither of these motives. In Table 4.6 are displayed attributions about self-cooperativeness (made at the end of each trial) broken down by the social class location of each subject's father. Column 4 displays the percentage of trials on which people indicated they were not cooperating (competing).

Table 4.5: Attributions For All Subjects

Type of Attribution	Number	Percent
Cooperating	806	84.6
Not Cooperating	95	10.0
Neither	52	5.5
Total	953	100.0

Social Class Location of Subjects' Fathers

The pattern of results observed in Table 4.6 supports the conjecture that people who come from social class backgrounds characterized by greater autonomy and power, would expect to receive greater proportions of the resource (though it should be emphasized that the size of the differences between groups is very small). Children of small employers were most likely to perceive their behavior as competitive (14%), followed by managers (13%), semiautonomous employees (10%), and workers (5%).

Table 4.6: Attributions by Father's Class Location

Father's Class Location	Type of Attribution	Number	Percent
Manager	Cooperating	116	86.6
	Not Cooperating	17	12.7
	Neither	1	0.7
	Total	134	100.0
Worker	Cooperating	336	91.3
	Not Cooperating	18	4.9
	Neither	14	3.8
	Total	368	100.0
Semiautonmous Employee	Cooperating	169	81.3
	Not Cooperating	21	10.1
	Neither	18	8.7
	Total	208	100.0
Small Employer	Cooperating	103	76.3
	Not Cooperating	19	14.1
	Neither	13	9.6
	Total	135	100.0

Observed-Ideal Difference Index Scores

Table 4.7 reveals subjects' resource harvesting behavior in terms of the average difference between how many fish they took per trial, and how many fish they would have taken if they were using an ideal resource management strategy.[15] In Table 4.7 this behavioral measure (OIDXS) is broken down by the social class location of subjects' fathers.[16] In column 5 of Table 4.7 are listed the hypothetical average amounts that individuals from given class backgrounds (father's class location) would overfish during ten trials - based on the OIDXS scores averaged across all members of that class location.

Table 4.7: Resource Behavior by Father's Class Location

Father's Class Location	OIDXS Score	S.D.	N.	N. over-fished during 10 trials	Percent over-fished
Manager	.91	1.12	13	9	45.5
Worker	.58	.71	34	6	29.0
Semiautonomous Employee	.81	.95	.21	8	40.5
Small Employer	.41	1.23	14	4	20.5

To put these results into perspective it should be noted that a person fishing using an ideal resource management strategy would harvest a total of 20 fish during 10 trials. It can be observed (in Table 4.7) that people whose fathers were managers would, on average, overharvest by 9 fish during 10 trials. Thus, as column 5 depicts, these subjects were overfishing by 46%, which indicates very inefficient resource harvesting behavior. Subjects whose fathers were semiautonomous employees overfished by 41%; subjects whose fathers were workers overfished by 29%; and subjects whose fathers were small employers overfished by 21%. Thus, people whose fathers were managers were, ironically, the poorest resource managers, and overfished over twice as much as subjects whose fathers were small employers. Interpretation of these results should be tempered by the fact that there was a great deal of overlap between categories based on the standard deviations of OIDXS.

With the exception of "small employers", this pattern of results is similar to that observed in Table 4.6. People in class locations which were less likely to report competing were more likely to behave "conservationally". The discrepancy for "small employers" between these two measures is quite striking.

Table 4.8: Frequencies of Cooperation and Defection

All Subjects

Measure of Cooperation	Defection f	Defection %	Cooperation f	Cooperation %	Total f	Total %
Share	72	7.6	881	92.4	953	100.0
Status Quo	421	44.2	532	55.8	953	100.0
Ideal World	522	54.8	431	45.2	953	100.0

Table 4.9: Frequencies of Cooperation and Defection

by Father's Class Location

Class	Measure of Coop.	Defection f	Defection %	Cooperation f	Cooperation %	Total f	Total %
Manager	S.	14	10.4	120	89.6	134	100.0
	S.Q.	68	50.7	66	49.3	134	100.0
	I.W.	84	62.7	50	37.3	134	100.0
Worker	S.	9	2.4	359	97.6	368	100.0
	S.Q.	152	41.3	216	58.7	368	100.0
	I.W.	197	53.5	171	46.5	368	100.0
Semiautonomous Employee	S.	22	10.6	186	89.4	208	100.0
	S.Q.	108	51.9	100	48.1	208	100.0
	I.W.	123	59.1	85	40.9	208	100.0
Small Employer	S.	13	9.6	122	90.4	135	100.0
	S.Q.	43	31.9	92	68.1	135	100.0
	I.W.	58	43.0	77	57.0	135	100.0

Frequencies of Cooperation and Defection

The number of cooperative and defective behaviors within each of the three categorization schemes (share, status quo, ideal world) for all subjects can be found in Table 4.8. In review, these measures were defined as follows. "Share" refers to any harvest of one-third or less. "Status quo" refers to harvests that maintain the resource at its current level. "Ideal world" refers to harvests which maintain a perfect balance between maximum resource regeneration and maximum harvest yield. Not surprisingly, the amount of cooperation decreases and the amount of defection increases, as one goes from the share categorization scheme, to status quo, to ideal world. Overall, subjects defected more when behavior was defined by the ideal world scheme. Table 4.9 depicts frequencies of subjects' cooperation and defection, broken down by the social class location of their fathers. Under the "share scheme", people whose fathers were workers, were the most cooperative (98%); the other three class categories had similar results: small employers (90%), managers (90%), and semiautonomous employees (89%). The share scheme for categorizing behavior resulted in a slightly different distribution when broken down by subjects' class background based on the social class of subjects' fathers. Under the "status quo" scheme, people whose fathers were small employers were nine per cent more likely to cooperate (68%) than were people whose fathers were workers (59%); people in the "worker" category were about 10% more likely to cooperate than members of the other class categories - "managers" (49%), and semiautonomous employees (48%). Under the "ideal world" scheme this pattern was generally repeated, with the exception, of a 4% gap that developed between the semiautonmous employee and manager categories. Thus,

under the ideal world scheme, people whose fathers were small employers, cooperated 57% of the time; the cooperation rate for workers was 47%, for semiautonomous employees 41%, and for managers 37%. As limited cognitive processing theory (Dawes, 1980) would predict, it appears that people adopt simple rather than complex resource harvesting strategies.

Perceptions about Cooperation

Table 4.10 displays the frequencies and percentages of cooperative and defective behaviors, as defined by the 3 different classification schemes, for trials on which subjects indicated they were cooperating.[17] It can be observed that when the "share" classification is used, 97% of people who reported they were cooperating, were cooperating behaviorally. If the "status quo" classification is employed, the rate of behavioral cooperation drops to 62%. When the "ideal world" definition is employed only about half of the people who perceive they are cooperating, are actually cooperating - behaviorally. Again, this result supports the limited cognitive processing explanation for commons dilemmas. When behavior is defined in terms of its consequences, for resource preservation, people act in accordance with self interest about 50% of the time - even when they perceive they are cooperating! The network implication of this finding, is that social networks may provide a readily exploitable mechanism through which information can be made salient to actors in the commons. In such cases, perceived behavior will be more likely to reflect objective behavior - as defined from a conservation viewpoint.

Table 4.10: Cooperative Attributions by Behavior

All Subjects

Measure of Cooperation	Behavior			
	Cooperative		Defective	
	f	%	f	%
Share	783	97.1	23	2.9
Status Quo	500	62.0	306	38.0
Ideal World	402	49.9	404	50.1

In Table 4.11 are displayed the percentages of cooperative versus defective behaviors (using the three classification schemes) when subjects perceived that they were cooperating, broken down by the class location of subjects' fathers. Interestingly, these results are similar to those observed for behavior alone. As the definition of cooperation is made more rigorous, moving from the share to the status quo to the ideal world measure, people are not only less cooperative (as observed in Tables 4.5 and 4.6) but from a resource management viewpoint, at least, they are also less accurate in their perceptions of cooperativeness.

Table 4.11: Cooperative Attributions by Behavior

Father's Class Location

Father's Class Location	% Cooperative			% Defective		
	S.	S.Q.	I.W.	S.	S.Q.	I.W.
Manager	93.1	56.0	43.1	6.9	44.0	56.9
Semiautomous Employee	97.0	55.0	46.2	3.0	45.0	53.8
Worker	98.8	64.4	49.7	1.2	36.6	50.3
Small Employer	95.1	73.9	60.2	4.9	26.2	39.8

Under the share scheme, workers (99%) and semiautonmous employees (97%) were slightly more accurate in their self-perceptions of cooperativeness than were small employers (95%) and managers (93%). Using the status quo classification scheme, small employers were the most accurate in their perceptions (74%), followed by workers (64%), managers (56%), and semiautonomous employees (55%). Finally, employing the ideal world scheme, it can be observed that only two groups were accurate at least 50% of the time, in their self-perceptions of cooperativeness. Small employers (60%) were substantially more accurate than the other groups, workers (50%), semiautonomous employees (46%) and managers (43%).

Conclusions about the Influence of Father's Social Class Location

Although these results lend support to the stated hypothesis about the relation between social class background and resource behavior (with the possible exception of those subjects whose fathers were "small employers"), there are some possible qualifications that might be made about the nature of this relationship. Further, the size of the relationship is very small. The conclusions drawn here should be considered as suggestive of trends future research might explore. Social class influences on behavior take a number of forms due to the differing sets of experiences of those from different social class backgrounds. For example, it may be that the most efficient resource managers are individuals who have had the most experience managing limited resources and these skills would presumably be passed on to some degree from parent to child through socialization. In the present study subjects whose fathers were small employers, tended to be were the most efficient resource managers. This would make sense

in that small employers not only would have to develop good management skills in general, but they would need to be very efficient allocators of financial resources as they would have more limited budgets to work with than managers of larger firms. Another factor which is probably involved is level of income. This, unfortunately, was not measured in the present study. For the other three groups there were likely relationships between income, class location, and resource behavior. One might well ask, if small employers are good resource managers, due to their experience as managers, shouldn't "managers" be good resource managers? Remember these labels describe people who come from certain "class socializations" - they are not actually managers, etc.. The fathers who were identified as managers in the present research, tended to be managers of either relatively large private sector firms, or were in management positions within the civil service. It is likely these people managed budgets that were not as limited as those of small employers, and hence were not as pressured to be efficient resource managers. Further, these people probably had relatively high incomes compared with semiautonomous employees, and workers in particular. Thus, it could be argued that they were not under great pressure to be efficient with their personal financial resources either, as these were not particularly scarce.

The size of the differences in the measures of resource behavior between subjects whose fathers were managers and those whose fathers were semiautonomous employees were not large, but they were relatively consistent. This same rationale might also be used to explain the differences between semiautonomous employees and workers. As noted above, semiautonomous employees probably make slightly less in terms of income than managers, but also

probably make somewhat more than do workers. Workers were the most efficient resource managers, next to small employers. Again, employing the rationale outlined above, workers probably have the most limited personal budgets, and hence would have to learn be quite efficient in managing their limited finances. In support of this argument, it might be noted that for those with limited incomes, the home is a location where many cost cutting measures are probably undertaken. Further, it is a likely setting in which people are socialized in resource management skills. The findings regarding the accuracy of people's perceptions about their own behavior lend additional support to the interpretation of the data outlined above. As noted in Table 4.11, subjects' whose fathers were small employers were the most likely to actually behave cooperatively, under the ideal world scheme, when they thought they were cooperating; workers were the second most accurate in their self-perceptions about cooperativeness, while semiautonomous employees, and managers were third and fourth, respectively.

There is some evidence for this interpretation in experimental commons dilemma research. For instance, Watzke et al. (1972) studied how the degree of resource depletion influences resource behavior in commons dilemmas. They found that participants engaged in more efficient resource behavior when a resource was half-degraded than when it was pure. This finding was later replicated by Rubenstein et al. (1975). However, this issue is far from resolved. Brechner (1977) has reported results in the opposite direction using a variant of this type of experiment. This points to the need for further study concerning resource depletion.

A related form of the "social class experience" explanation is based on the sets of experiences individuals gain through interactions with others due to class-based differences in authority relations and self-autonomy in the workplace - which are then passed on to their children through socialization. Although small employers generally have a substantial degree of authority over others, it is important that they have good interpersonal skills in dealing with employees, as the performance of employees is more crucial to the survival of a small business, than to a large one - because of economies of scale, etc.. Further, the small employer is more likely to be involved with a greater cross section of employees, than would the manager of a large firm, or government ministry, due to the typical organizational structure of larger firms and institutions. Workers need to be able to cooperate with others, as they have no authority and little self-autonomy. By definition, semiautonomous employees have more self-autonomy than workers, and hence less of a need to cooperate with co-workers. Managers, though they also need to have good interpersonal skills, generally have a high level of authority over others, and therefore have less of a need to cooperate with others. It may also be, that having higher levels of power, authority and autonomy, leads people to be more self-centered in their interactions and thus less perceptive about how their behaviors relate to others, especially patterns of behaviors such as "cooperativeness".

In reiteration, the strength of support the present data lend to the conclusions presented here are tentative at best. These results and observations are, however, suggestive of directions future lines of inquiry might take.

Social Class Location of Subjects' Mothers

The social class locations of subjects' mothers were also determined using the methodology outlined earlier. There were three categories of sufficient size for analysis.[18] These included "semiautonomous employees", "workers", and one non-class location, "homemakers".

In Table 4.12 are displayed attributions about self-cooperativeness made at the end of each trial, broken down by the social class location of subjects' mothers. In column 4, are displayed the percentage of trials on which people indicated they were not cooperating (competing). Again, the pattern of results for the two class locations is in accordance with the stated hypothesis: people who come from social class backgrounds characterized by greater autonomy and power, would expect to receive greater proportions of the resource. "Semiautonomous employees" were most likely to perceive their behavior as competitive (14%), compared with "workers" (9%). "Homemakers", a non-class location under the present classification scheme, perceived they were competing 9% of the time.

Table 4.12: Attributions by Mother's Class Location

Mother's Class Location	Type of Attribution	Number	Percent
Worker	Cooperating	271	88.6
	Not Cooperating	26	8.5
	Neither	9	2.9
	Total	306	100.0
Semiautonomous Employee	Cooperating	193	76.6
	Not Cooperating	35	13.9
	Neither	18	8.7
	Total	252	100.0
Homemaker	Cooperating	196	84.1
	Not Cooperating	21	9.0
	Neither	16	6.9
	Total	233	100.0

Observed-Ideal Difference Index Scores

In Table 4.13, OIDXS is broken down by the social class location of subjects' mothers. Listed in column 5 of Table 4.13 are the hypothetical average amounts that individuals from different class backgrounds (based on their mother's social class location) would overfish during ten trials - based on the OIDXS scores averaged across all members of each class location. It can be observed that if resource behavior is defined in these terms, there is no difference between the three categories (however, these figures do involve rounding). Further, as column 6 reveals, there is only a difference of 1.5% between the category in which subjects overfished the least and the category in which they overfished the most. Possible reasons for this outcome will be discussed later in this section.

Table 4.13: Resource Behavior by Mother's Class Location

Mother's Class Location	OIDXS Score	S.D.	N.	N. overfished during 10 trials	Percent overfished
Worker	.69	.94	30	7	34.5
Semiautonomous Employee	.68	1.05	25	7	34.0
Homemaker	.66	.90	22	7	33.0

Frequencies of Cooperation and Defection

Table 4.14 depicts the frequencies of subjects' cooperation and defection, broken down by the social class location of their mother. Under the "share" and the "status quo" scheme, "workers" were the most cooperative. Under the "ideal world" scheme, "homemakers" were just as cooperative as "workers". Under all three schemes, "semiautonomous employees" were the least cooperative. The size of the differences on these measures between "workers" and "homemakers" were inconsequential (1-3%). The size of the difference between "workers" and "semiautonomous employees", however, was somewhat more substantial (5-7%).

Table 4.14: Frequencies of Cooperation and Defection

by Mother's Class Location

Class Location	Measure of Coop.	Defection f	Defection %	Cooperation f	Cooperation %	Total f	Total %
Workers	S.	15	4.9	291	95.1	306	100.0
	S.Q.	122	39.9	184	60.1	306	100.0
	I.W.	159	52.0	147	48.0	306	100.0
Semiautomous Employees	S.	25	9.9	227	90.1	252	100.0
	S.Q.	119	47.2	133	52.8	252	100.0
	I.W.	144	57.1	108	42.9	252	100.0
Homemakers	S.	18	7.7	215	92.3	233	100.0
	S.Q.	97	41.6	136	58.4	233	100.0
	I.W.	121	51.9	112	48.1	233	100.0

Perceptions about Cooperation

In Table 4.15 are displayed the percentages of cooperative versus defective behaviors, using the three classification schemes, when subjects perceived that they were cooperating, broken down by the class location of subjects' mothers. Under the ideal world scheme, "homemakers" (55%) and "workers" (53%) were the most accurate in their self-perceptions about cooperativeness, while "semiautonomous employees" were somewhat less accurate (47%).

Table 4.15: Cooperative Attributions by Behavior

Mother's Class Location

Mother's Class Location	Behavior					
	% Cooperative			% Defective		
	S.	S.Q.	I.W.	S.	S.Q.	I.W.
Semiautonomous Employees	95.9	58.5	46.6	4.1	41.5	53.4
Workers	98.2	66.1	52.8	1.8	33.9	47.2
Homemakers	98.0	66.8	54.6	2.0	33.2	45.4

Conclusions about the Influence of Mother's Social Class location

As with the "fathers' class location data", the same general relations between class background, attributions, and behavior were observed using the data on subjects' mothers locations. However, qualifications should be made about these results. The size of the difference between the two class categories "workers" and "semiautonomous employees" was not as pronounced as it was when these categories were based on the social class location of subjects' fathers (especially for OIDXS). There are several possible reasons for this, all relating to the dominance of males in our society. First, subjects, on average, may be influenced more by their fathers than their mothers. Secondly, females in the same work place often are not given as much authority as males - or do not exercise it. Thirdly, on average, females in the same occupations as males consistently earn less money. All of these societal processes may have contributed to the relatively muted differences between the two class categories (on OIDXS) as compared with those based on the class location of people's fathers.

Interestingly, the results for "homemakers" were very similar to those for "workers". This makes sense in that their levels of authority and self-autonomy like that of "workers", has traditionally been very low. They are not wage earners, and must manage on what fixed finances are allocated to them. Again, the conclusions drawn here are tentative, but do point to trends future research might explore.

Political Identification and Resource Behavior

As noted earlier, subjects were asked to indicate their political attitudes. Based on the general philosophies underlying each of these labels (conservative, liberal, socialist) it was predicted that "conservatives" would be most likely to report participating in the simulation as individuals, "socialists" would be most likely to report participating as group members, and "liberals" would fall somewhere in between. Further, in accordance with the above prediction, it was predicted that those who identified their political attitudes as "socialist" would be more "efficient" resource managers (in terms of OIDXS) than those who identified themselves as "liberals", who in turn would be more efficient than those who identified themselves as "conservatives".

Social Identity

Table 4.16 shows the average score on social identity[19] for each "political group". Of these categories, "socialists" were most likely to think of themselves as group members, "conservatives" were next most likely, and "liberals" were least likely to think of themselves as group members. People who identified their political attitude as "other", were the most likely to identify themselves as group members. The relation of "socialists" to "liberals", and to "conservatives" is consistent with that which was hypothesized. The relative postions of "conservatives" and "liberals", however, is contrary to the stated hypothesis. Possible reasons for this pattern of results will be explored later in this section. It should be emphasized though, that the differences between groups is extremely small, and the overlap between them is very large.

Table 4.16: Social Identity by Political Attitude

Political Attitude	Mean SOCID Score	S.D.	N.
Socialist	6.8	2.4	25
Liberal	6.5	2.8	29
Conservative	6.6	2.5	26
Other	7.1	1.7	10

Attributions about Cooperation

In Table 4.17 are displayed subjects' attributions about self-cooperativeness, made at the end of each trial, broken down by political attitudes. In column 4, are displayed the percentage of trials on which people indicated they were not cooperating (competing). Again, the same general pattern of results was observed, though the differences between groups were quite small. "Others" were least likely to state they intended to not cooperate (6%), followed by "socialists" (10%), "conservatives" (11%), and "liberals" (12%), respectively. If cooperative attributions are looked at, a slightly different pattern of results emerges. As can be observed in column 4, socialists perceived themselves as cooperating 89% of the time, followed by liberals 84%, conservatives 82%, and others 81%. This was the expected group ordering (excluding "others"). The results for these latter two groups, however, are influenced by the larger proportions of people who indicated they were neither cooperating nor competing: others 14%, and conservatives 8%.

Table 4.17: Attributions by Political Attitude

Political Attitude	Type of Attribution	Number	Percent
Socialists	Cooperating	219	89.4
	Not Cooperating	24	9.8
	Neither	2	0.8
	Total	245	100.0
Liberals	Cooperating	252	84.0
	Not Cooperating	35	11.7
	Neither	13	4.3
	Total	300	100.0
Conservatives	Cooperating	217	81.6
	Not Cooperating	29	10.9
	Neither	20	7.5
	Total	266	100.0
Others	Cooperating	100	80.6
	Not Cooperating	7	5.6
	Neither	17	13.7
	Total	124	100.0

Observed-Ideal Difference Index Scores

In Table 4.18 OIDXS is broken down by political attitudes. Column 5 of Table 4.18, lists the hypothetical average amounts that individuals from the different "political groups" would overfish during ten trials - based on the OIDXS scores averaged across all members of that group. Listed in column 6 are the (average) percentages overfished by political attitude. On average, liberals overfished the most (49%), followed by socialists (33%), conservatives (32%), and others (12%). Thus, based on OIDXS, liberals were substantially less efficient in their behavior than the other groups. "Others" were substantially more efficient than the three main groups. Socialists and conservatives were moderately efficient in their resource behavior, and quite similar to one another in their rate of harvesting.

Table 4.18: Resource Behavior by Political Attitude

Political Attitude Location	OIDXS Score	S.D.	N.	N. over-fished during 10 trials	Percent over-fished
Socialist	.66	.96	25	7	33.0%
Liberal	.98	1.00	29	10	49.0%
Conservative	.63	.69	26	6	31.5%
Other	.23	1.21	11	2	11.5%

Frequencies of Cooperation and Defection

Table 4.19 depicts frequencies of subjects' cooperation and defection, broken down by political attitudes. Using the ideal world measure, the most rigorous of the three measures, "others" were behaviorally the most cooperative (57%), followed by socialists (48%), conservatives (44%), and liberals (39%). This finding corresponds inversely to subjects' self-attributions about non-cooperation as depicted in Table 4.17.

Table 4.19: Frequencies of Cooperation and Defection

by Political Attitude

Political Attitude	Measure of Coop.	Defection f	Defection %	Cooperation f	Cooperation %	Total f	Total %
Socialist	S.	18	7.3	227	92.7	245	100.0
	S.Q.	97	39.6	148	60.4	245	100.0
	I.W.	127	51.8	118	48.2	245	100.0
Liberal	S.	25	8.3	275	91.7	300	100.0
	S.Q.	153	51.0	147	49.0	300	100.0
	I.W.	184	61.3	116	38.7	300	100.0
Conservative	S.	20	7.5	246	92.5	266	100.0
	S.Q.	120	45.1	146	54.9	266	100.0
	I.W.	150	56.4	116	43.6	266	100.0
Other	S.	9	7.3	115	92.7	124	100.0
	S.Q.	44	35.5	80	64.5	124	100.0
	I.W.	53	42.7	71	57.3	124	100.0

Perceptions about Cooperation

In Table 4.20 are displayed the percentages of cooperative versus defective behaviors, using the three classification schemes, when subjects perceived that they were cooperating, broken down by political attitudes. Under the ideal world scheme, "others" were the most accurate in their self-perceptions of cooperativeness (55%), followed by socialists (53%), conservatives (52%) and liberals (44%).

Table 4.20: Cooperative Attributions by Behavior

by Political Attitude

Political Attitude	Behavior					
	% Cooperative			% Defective		
	S.	S.Q.	I.W.	S.	S.Q.	I.W.
Socialist	97.3	65.8	52.5	2.7	34.2	47.5
Liberal	96.4	55.2	43.7	3.6	44.8	56.3
Conservative	97.7	65.4	51.6	2.3	34.6	48.9
Other	97.0	64.0	55.0	3.0	36.0	45.0

Conclusions about Political Attitudes

Originally it was hypothesized that socialists would be the best resource managers because they would value collective or group interests the most. It was hypothesized that conservatives would be the poorest resource managers because they would value individual interest the most. Finally, it was predicted that liberals would fall somewhere in between these other two groups in their resource behavior. It was intended that these labels would refer to political philosophies, not to political parties. It should be noted, however, that people develop attitudes in a social context and thus, their interpretation of a given political philosophy is probably influenced to some degree by how that philosophy, is elaborated by the party that is most closely identified with it. In Canada the parties that most closely adhere to the labels used in this study are: the New Democratic Party ("socialist"), the Liberal Party ("liberal"), and the Progressive Conservative Party ("conservative").[20]

Originally it was conjectured that people would act in accordance with the socio-economic values which are generally espoused by adherents of these political philosophies in Canada. For instance, it was thought that "modern conservatives" would be most likely to engage in self-interest; as conservatives generally espouse a more laissez-faire approach to economics. "Socialists" on the other hand, emphasize state planning in the economy, and are generally more concerned with protecting collective interests. Thus it was predicted they would be more likely to act with regard to group interests and favor equality. "Modern liberals" (as opposed to classical liberals whose philosphy has been adopted by to some extent by modern conservatives as depicted above), have tended to have

adopt a moderate postion relative to these two extremes. Although in Canada, it might be argued that liberals are closer on the political continuum to conservatives than they are to socialists. Therefore it was expected that the behavior of liberals would fall somewhere between that of socialists and conservatives on the continuum between self-interest and collective interest as measured by resource behavior.

The present results do not support this hypothesis. If any conclusion can be made about the present pattern of results, it might be noted that conservatives and socialists were surprisingly similar on most measures and were somewhat better resource managers than liberals in that they engaged in more efficient resource behavior based on OIDXS, cooperated more often, and their self-perceptions about cooperation were more accurate (from a conservation standpoint).[21]

It might further be noted that in this simulation, people who identified with none of the major political philosophies (discussed above) were the best resource managers of all. There is a very good reason for this outcome. A number of people who indicated their political attitude as "other", indicated they identified with the Green Party. The Greens are a political party whose central philosophy is concern with the environment. Thus, it is hardly surprising that people who identified their political attitude as "Green Party" were the best resource managers in the present scenario. Bunyard et al. (1987) in comparing the political orientation of the Green party in Great Britain to that of the Conservative party, the Labour party, and the SDP/Liberal alliance, state:

> The Green party (formerly the Ecology Party) differs from the other parties in that its policies stem from the belief that a healthy environment must underlie all action. The Greens therefore accept

> the constraints of a planet with finite resources while looking for ways in which best to utilise its potential. (Bunyard et al., 1987:317-318)[22]

Conclusions

The present study examined the relation between group and individual level social psychological variables, and people's resource behavior in a simulated commons dilemma. The more intensely people identified themselves as group members in participating in the simulation, the more "efficient" they were in resource harvesting and the more likely they were to: feel they understood the principles of the simulation; perceive that others' performance influenced the outcome of the simulation; evaluate their own behavior as being fair; value taking only their own (equal) share of fish; and indicate they were not "greedy" in taking fish. This pattern of results generally supports the thesis that "social identity" is related to resource behavior in some resource commons. The present findings also suggest avenues future research might take in examining the relation between social identity, other individual level social psychological variables, and resource behavior.

The findings regarding the relation between social class background and resource behavior, though interesting, are not conclusive at this point. In future research, social class background needs to be measured more precisely. How class consciousness is implicated in this problem, might also be explored. Finally, other measures such as socio-economic status might be included in future analyses. For instance the relative predictive power of S.E.S. vs. social class location (ala Wright et al., 1982) on resource behavior might be explored.

Likewise, the findings regarding the relation between political attitudes and resource behavior, though interesting, were not conclusive. It is uncertain whether future research examining the relation between political attitudes and resource behavior is likely to be fruitful. First, as public opinion polls indicate, people's political preferences, as far as parties and candidates are concerned, tend to be quite variable over time. It is uncertain how this phenomenon relates to people's adherence to given political philosophies. However, as has been pointed out by researchers, politics in Canada are carried out on relatively non-ideological grounds. Thus it is likely that people's political attitudes are based more on preferences about what a party currently proposes to do if elected, rather than on any underlying political philosophy as espoused by the traditional political parties in Canada.

An exception to this conclusion, that any relation between political attitude and resource behavior is likely to be weak, is likely to be observed where people identify with a non-traditional political party/philosophy which is expressly concerned with environmental issues, such as the Green party. Belonging to an environmental organization or lobby group, such as Green Peace, or the Sierra Club, in most cases probably means that an individual places high value on solving environmental problems. Identification with such parties, philosophies, or organizations probably has substantial meaning for an individual[23] and thus is likely to be related to that individual's resource behavior.

Another problem that probably prevented a stronger relationship between political orientation and resource behavior being observed, was the lack of precision in measuring political attitudes. In the present study, people were merely

asked to select a label that most closely corresponded with their political orientation. In future research, people's commitment to given political orientations should be gauged by measuring the level of intensity with which people adhere to these.[24]

In naturalistic commons settings, many of the variables examined in this study are likely influenced by social network effects. The observed relations between these variables and resource behavior in the simulated commons suggest that a more explicit network approach to commons problems should be explored.

Notes

1 It is further assumed that people are "sufficiently" rational to become aware of these interests.

2 These effects were less pronounced in a corresponding study of Americans (see Wright, 1986).

3 It should be noted that some network influences may diffuse rather than promote class interest based consciousness. One example of this would be cross-class friendship networks such as those which are characteristic of single industry communities in Canada (Lucas, 1971).

4 Wright et al (1982) conducted extensive interviews with subjects, and asked them detailed questions to tease out dimensions for each of the variables used to operationalize social class location. In the present analysis, respondents were asked to briefly describe their parents work. These descriptions provided the basis for which relevant social class variables, outlined in Table 4.1, were inferred.

5 Subjects who think they should catch only their own (equal) share of fish rather

than catch as many fish as desired.

6 Exploratory correlational analysis was undertaken on the field survey data. It was observed that for all respondents combined (sport and commercial fishers) the more that individuals valued freedom over equality, the more they valued free enterprise over socialism, $r = .64$ ($n = 28$, $p. < .000$).

7 Psychologists rarely ask their subjects what they think they are doing (Wegner and Vallacher, 1985), and the gulf between what psychologists assume and what subjects actually think, may sometimes be large.

This issue has probably been neglected because researchers have assumed that people know when they are cooperating and when they are not. Some indications of this assumption are: 1) the way in which social dilemmas are described in which subjects choose between explicit alternatives (e.g. "selfishness" vs. "altruism"); 2) the belief that people rationally and logically pursue their own interests (Edney, 1979); 3) the concern with "free riders" - people who defect because they expect others to cooperate, making their own cooperation unnecessary (Edney, 1979) ... free riders, and other people who defect out of fear of being one of the few "suckers" who cooperate (Yamagishi and Sato, 1986), must know how they are behaving in social dilemmas; and 4) the call for non-egositic solutions to social dilemmas (Lynn and Oldenquist, 1986) - appeals to altruism, conscience, and moral motives are based on the assumption that people know when they are cooperating or defecting and that such appeals could encourage cooperation.

8 The present study will focus only on data obtained for question a.

9 Subjects participated in two sessions of up to seven trials. The seventh trial was excluded in the data analysis, however, because there was some possibility

that subjects could guess the total number of trials, and it was felt that data collected on the seventh trial might bias the overall pattern of results.

10 The ideal strategy from a resource management perspective, taking into consideration the regeneration structure of the resource, would be for the individuals involved to think in terms of being members of a group as a whole. Optimally they should let the resource reach its maximum (which is the state of the resource at the beginning of the 1st trial), and then take half of the resource on each trial. Doing so, ensures the maximum number of fish possible are harvested - yet allows the resource stock equilibrium to remain at its maximum.

For an individual on any given trial, the strategy would be either to take his or her equal share of the proportion of the resource that is to be harvested, or to restrain from harvesting in order to allow the resource to regenerate. Of course the resource could also be harvested optimally with individual members taking unequal amounts, and the dynamics of the game along with individual idiosyncrasies led to this pattern of harvesting on at least one occasion. However, inequality of harvesting in this situation, in view of the structure of the game, makes little sense in terms of equity theory - as people's inputs are equal. Thus, if the resource is harvested optimally, it should be shared equally. If on the other hand, if the resource is harvested inefficiently by the group, there is a good likelihood that inequality will occur. Some people will harvest optimally while others will not; and possibly no one will harvest optimally.

11 This was also the basis for defining an ideal harvest from which the observed-ideal difference index score is derived.

12 For example, based on my observations made during the study, it appeared that those individuals whose backgrounds were in economics and/or mathematics had a better understanding of the dilemma."

13 Cohen's (1979) discussion of distributive justice and individual deserving is of relevance to this finding, and thus suggests a further line of potential inquiry into commons dilemma research.

14 As the data exist to calculate this measure, this relation may be explored in further analysis.

15 Based on equality amongst participants, the regeneration rate of the resource, and maximum resource harvesting yield after taking into account these former considerations.

16 Only categories for which there were at least 10 subjects were included in this analysis.

17 The correspondence between attributions and behavior has been analysed only for cooperative attributions because of the greater number of these responses - 85% of all attributions were cooperative, while only 10% were non-cooperative (competitive).

18 Again, only categories in which there were at least ten persons were analysed.

19 In playing the game, whether subjects thought of themselves more as individuals or group members.

20 This assumption , however, may be somewhat flawed. For instance, it has been argued that the political and ideological elites in Canada have provided only minimal stimulation about class and ideological issues (Ogmundson, 1976). There has been a lack of class voting in Canada. This appears to be due to the lack of differentiation of class issues by the two major political

parties: (Liberals and Conservatives) (Ogmundson, 1976). In fact, it has been argued that both of these parties are relatively conservative (Porter, 1965).

21 There is an alternative hypothesis which became evident during the process of investigating the present results - though it is a highly speculative one. It might be that both conservatives and socialists tend to be oriented towards group interests (albeit from different perspectives), while liberals tend to be oriented towards individual interests.

For instance, conservatives are often characterized as placing high value on order, stability, and conservation (hence the label, conservative) - values which emphasize collective level interests (critics point out, however, that preserving order and resisting change serves the interests of the powerful and the wealthy). Robert Stanfield (1977), a former leader of the Progressive Conservative Party of Canada has described Conservative philosophy as characterized by a concern for order, stability, conservation, and preservation ... a concern for society at large (Fox, 1977).

Socialists place high value on egalitarianism, and argue that this goal requires a planned ecomomy, and some degree of state ownership of the means of production. Socialists, in addition to stressing the importance of equality of opportunity, often place importance on equality of condition as well. David Lewis (1977), a former leader of the Canadian New Democratic Party, has emphasized the importance of equality to socialist philosophy. "This - the classless society based on equality - is the major aim of democratic socialism" (Fox, 1977:272). Van Loon and Whittington (1976:264) in examining the history of the N.D.P. in Canada state: "The Liberals and Progressive Conservatives have occassionaly sought to institute some rough notion of

'equality of opportunity', but the N.D.P. has tended to favor a more substantive equality here and now."

Liberals, although they are concerned with equality of opportunity, place high value on individual liberty. For example, Lester B. Pearson (1977), a former leader of the Liberal Party of Canada, and Canadian Prime Minister, in discussing liberalism has stated: "Liberalism ... while insisting on equality of opportunity, rejects any imposed equality which would discourage and destroy a man's initiative and enterprise." (Fox, 1977:265)

There is some evidence, as noted above, that modern liberal philosphy has a relatively greater orientation towards individualism than do conservative or socialist philosphies, in Canada at least. This line of thought might be tempered, however, by noting an observation made by many researchers of political parties in Canada:

> A lack of ideological content has characterized party politics in Canada ... Like the Democratic and Republican parties in the United States, the Liberal and Progressive Conservative parties in Canada are 'all encompassing' reflecting the interests of no particular social class. The electoral strategies of Canadian political parties have thus closely paralleled their Amercian counterparts (Ogmundson, 1975; Porter, 1965:368). Marger (1981:281)

In the present study there is some evidence that liberals were more oriented toward individualism, than were members of the other political categories. For instance, in one questionnaire item, subjects were asked whether they behaved because of: the situation they were in; their own independent intentions, desires, etc., without regard for how the other players played; or neither of these responses. (This same question was also asked regarding others.) It was observed that liberals were much more likely to attribute the behavior of themselves and of others to internal characteristics.

Liberals attributed their own behavior to internal factors 45% of the time, compared with conservatives 34%, socialists 32%, and others 27%. Liberals attributed the behavior of the other participants as caused by internal factors 44% of the time, compared with socialists 34%, conservatives 33%, and others 20%. Non-liberals may have been better resource managers because they focused more on the situation, and thus were more likely to understand the contingencies of different harvesting strategies based on the regeneration rate of the resource and the probable behaviors of the other participants.

22 Bunyard et al. further elaborate:

> Green politics is at odds with both contemporary capitalism and mainstream socialism. Capitalism depends on the permanent expansion of the economy and on the ruthless exploitation of the planet to fuel that expansion. People are treated primarily as consumers rather than as individuals in their own right. Socialism seeks to do much the same through the intervention of the state, with people treated primarily as units of production rather than individuals in their own right. The destruction of the planet, and accompanying oppression and alienation of its people, are the inevitable consequences of both ideologies.
>
> There is, however, an alternative, potentially Green, decentralist tradition of socialism, and a different attitude towards the entrepreneur - based on socially responsible, small-scale production. But at the moment, these alternatives are all but invisible. (Bunyard et al., 1987:318-319)

23 Relative to how identification with a traditional political party/philosophy would relate to the average individual's orientation towards environmental issues.

24 This could be done by employing some sort of scale or index, to measure the intensity of identification for a given political orientation.

Chapter 5

DISCUSSION

Section one of this chapter will briefly examine the overlap between the two studies discussed in the thesis. In section two, their findings will be summarized. In section three, the strengths and weaknesses of this research will be discussed. Section four will address some alternatives to the present research strategy. Section five will extend this discussion to briefly touch upon some theoretical considerations that future research within the commons dilemma paradigm might explore. In the final section, conclusions to be drawn from the thesis will be presented.

My thesis involved analysing data collected from two exploratory studies of the commons dilemma: 1) a field-survey of Pacific salmon fishers; and 2) a laboratory study in which people participated in a simulation of a fishery commons.

The two studies examined in the thesis were complementary in several respects. The field-survey was based in part on past experimental research, but also explored some previously unresearched variables (e.g., socio-political attitudes, the social values of freedom and equality, and attributions). The lab study served in part as an extension of the field-survey (political attitudes, social values, and attributions were examined), but also explored the variables, social identity, and social class.

The experiment examined the relationship between these social psychological variables and behavior in a simulated resource commons. The field-survey study did not measure resource harvesting directly, but rather examined a number of social psychological variables that laboratory experiments indicate are likely to influence conservation (e.g. communication).

Both studies explored the relation between social groups and the individual, but from different focal points. The field-survey examined network membership, a social variable. The lab study focused on social identity, a psychological variable, which is the component of the self-concept which relates the individual to groups.[1]

Summary of Findings

The central theme running through the two studies is the interrelation between social network processes, people's cognitions, and behavior in resource commons. Social networks influence their members' identity, attitudes, social evaluations, perceptions, interests, and behavior. For instance, among members of my sample, I observed that comercial salmon trollers and sport salmon fishers who belonged to a fishery-related network, communicated more with other fishers, held more "conservation-oriented" perceptions and attitudes, and were more positive in making social evaluations about other participants of the Pacific salmon fishery. In the laboratory computer simulation, it was observed that whether people thought of themselves as individuals or as group members influenced their resource harvesting behavior, and was correlated with a number of other social psychological variables such as: understanding the principles of the simulation;

perceiving others' behavior as influencing the outcome; evaluating their own behavior as fair; valuing "equality over freedom"; and indicating they were not greedy in resource harvesting. Further, the present results suggest there may be a relationship between people's resource harvesting behavior, their socio-political attitudes, and their social class background. The data regarding these latter relationships are very weak at present, but suggest avenues along which future research might proceed.

The differences observed between groups (commercial versus sport fishers) in the field-survey study were presumably due in part to different sets of experiences held by members of these two different groups, but likely were more influenced by differences in material and other self interests (payoffs). Differences within groups (association members versus non-members) were possibly due to adherence to social norms, information exchanges, and social evaluation - all of which are facilitated through through social interaction in the context of social networks.

Does this research validate experimental (commons dilemma) findings being generalized to naturalistic settings? The findings in the field-survey were supportive of past experimental work. For instance, those (association members) who communicated more often with others, held other attitudes, perceptions, and evaluations that would seem to indicate that they were "more conservationally oriented". The support for this conclusion is incomplete. In particular, resource harvesting behavior was not directly measured, so the validity of this conclusion is uncertain. In future research on the topic it would be useful to attempt to measure resource behavior empirically.

The strong relationship between social identity and resource behavior, as observed in the lab study, was interesting and supported previous findings (e.g. Messick and Brewer, 1983; Brewer and Krammer, 1986). In the field-survey, there was evidence to suggest that people were aware of their "fishing group's" interest, especially when respondents discussed favoritism in the fishery and other justice concerns. Unfortunately, no attempt was made to measure social identity in the field-survey. In future field work, the relations between social identity, other cognitive variables, and resource behavior should be explored.

In discussing the laboratory findings, I have not emphasized the discrepancy between how people thought they behaved and how they actually behaved. I have discussed this issue mainly in the context of network influences (such as coming from certain social class backgrounds), as this is the main theme of the thesis. The discrepancy between perception and behavior, is however, interesting in its own right. A common observation in laboratory simulations of commons dilemmas is that people often act in a manner similar to what one would expect in real world dilemmas. Further, they do not cooperate very much. This latter outcome is expected in the lab, as well as in the real world, because it is a rational way for individuals to behave in terms of individual interests.[2] An important issue that has not been adequately addressed is what people think they are doing in such dilemmas. In the present research, people were asked about their motives at intervals during the simulation, and the majority of people reported they were cooperating. Whether or not they are seen to be cooperating behaviorally, however, depends on how cooperation is defined by researchers. In terms of the present findings, if cooperation is defined in terms of allocation alone (the share

definition), then people were very cooperative. The "tragedy" is, however, that if resource management considerations such as maintaining the resource are brought into the equation, then there is a large gap between what people think they are doing and the effects of their behavior. This is an extremely important point to be observed by both experimental psychologists and policy makers. Experimental psychologists might note that how they define behavior is not necessarily how their subjects define behavior. Policy makers should take into consideration the possibility that resource depletion and denigration may occur not only from people exercising their self interests, but may also occur, in part, because people do not fully appreciate the nature of the limited commons when making self-perceptions about their own behavior.

Returning to the major theme of the thesis, the lab study suggested that there may be a relationship not only between group processes such as social identity, class background, and behavior, but also between group processes and people's perceptions of behavior. It should, again, be cautioned that the strength of the relationships observed were extremely weak, and that these findings should be interpreted as suggestive of issues future research might explore.

Although resource harvesters are guided to a large extent by economic forces, the ways in which they perceive and think about the other members of the commons, and as well as about the resource itself, also influences their behavior. One of the implications that can be drawn from these two studies is that examining the problem of the commons from a "game theory" perspective may not always be fully adequate - especially if policy makers adopt this perspective in trying to change the "payoffs" and hence the structure of such problems so that

they are no longer dilemmas. People's perceptions are systematically biased by motivational and cognitive factors. Further, the manner in which people perceive the state of a given resource, and justice in resource allocation, is influenced by social comparison in the context of interpersonal networks. Any "restructuring" of a commons dilemma must take these cognitive and social structural processes into account.

Strengths and Weaknesses of the Research

Methodological Considerations

In review, the field-survey study employed a mixed design combining a structured questionnaire with unstructured field interviews. This strategy allowed quantitative data to be collected based on people's self-reports about their attitudes, perceptions, and social evaluations; thus enabling some descriptive statistical analysis. The qualitative data obtained through unstructured interviews with subjects allowed "the atmosphere" of the situation to be recorded. In many instances fishers' comments were useful in providing additional meaning to the data obtained from the structured survey questionnaire items.

One weakness of the study was the sampling technique employed. This study relied on a convenience sample, therefore no generalizations can be inferred to a larger population. Use of this non-random sample made a more sophisticated analysis involving inferential statistics inappropriate. This fact is not necessarily a serious weakness of the study, as it is difficult to employ random sampling when conducting field research. The sampling strategy, and desired statistical analysis is, however, a consideration for future research to take into account.

The laboratory study involved a laboratory game simulation with a follow-up questionnaire. The "control" inherent in this method is typically viewed as a strength (Bailey, 1982). A potential weakness is the artificiality of the laboratory setting. Further, because a nonprobability sample was also employed in this study, the findings cannot be generalized to a larger population.

Measurements were imprecise in both studies. In future research, indices based on multiple questionnaire items to measure variables might be employed, rather than using single items as was often the case in the present research.

Small effect sizes were expected to be observed in the present study (and were). This is partly due to the fact that this research was carried out in relatively uncharted waters. As variables are measured with greater precision in future research, one might expect to observe larger effect sizes. Also, if inferential statistics are to be used, a larger sample size would be desirable - especially if one is expecting to observe small effects (see Cohen, 1977).

Many of the problems noted above are to be expected in exploratory research. Future research, replicating parts of this work, and building on it, would likely lead to more precise measurements and stronger findings.

Theoretical Considerations

This research was carried out from a gaming/game theory perspective. Game theory depicts hypothetical situations in terms of the payoffs for certain behaviors to individuals involved such situations. Game theory is normative (rather than descriptive) in the sense that it depicts what people should do in given situations, based on what is rational in terms of payoffs and probable outcomes, rather than what they actually do. Gaming refers to experiments and/or simulations in which

people play "games" which are structured to resemble real life situations. Different variables are manipulated (for instance, the payoffs or group size) and the participants' behavior is recorded. Gaming is descriptive in that these approaches describe what people actually do in given situations.

The lab study was a direct example of a gaming approach. The field-survey was based on elements of both game theory, and gaming. The study examined a number of variables drawn from previous gaming studies. Rational behavior, as depicted by game theory, for people (operating on the basis of self-interest) engaged in the Pacific salmon fishery commons was described. Indicators of people's behavior were then observed and discussed in terms of how closely these appeared to reflect group versus individual interests.

An important point that needs to be made is that there are two different levels of rationality: individual and group level rationality. Past researchers (e.g., Messick and Brewer, 1983; Brewer and Krammer, 1986) have argued that inducing group level rationality may be one way to solve commons and other social dilemmas. The present research has provided some support for this argument. The self-reports of individuals in the field-survey study suggested that fishers were influenced by group interests and, further, that members of resource relevant networks were somewhat more sensitive to the state of the resource. In the lab study, it was observed that people who identified more strongly with group interests, acted more often to conserve the resource. In addition, the data suggested that people who identified with a environmental political party, namely the Green Party, were the best resource managers - compared with those who identified with other political parties.

One weakness of the field-study resulted from the perspective taken in this research. Working within a "social psychological game theory" paradigm, led me to ignore social structures in developing the survey-questionnaire. For instance, I asked no questions about social class. I did not ask fishers whether they were workers or owners. In both studies I might also have examined class consciousness.

Although the influence of social networks on individuals in resource commons was one of the main themes of the thesis, this strategy of analysis was developed after the data were collected, as this was exploratory research. I did not ask subjects about "their reference group(s)" - except for some indirect questions. Nor did I ask about the reference individuals people use in making social comparisons, etc.. In the present analysis I proceeded on the assumption that one's membership group is also one's reference group. Although this is not neccessarily the case, the data suggest that this assumption holds some water, in that people's evaluations, interests, etc., were generally reflective of those of their membership group. In future research, subjects should be asked specifically about the groups and individuals they refer to in making social evaluations.

Another short coming of the present research is the fact that I do not account for who joins associations, and why. I cannot discount, on the basis of the present data, the possibility that those who join associations are already different from those who do not. This possibility may account for the observed differences between association members and non-members.

Other theoretical perspectives I might have given more emphasis to, are those found in the literatures on collective action, voluntary associations and

organizations, and the production of public goods; in particular, the classic work of Mancur Olson (1965) in "The Logic of Collective Action", and also the works of Marwell, Ames, and Oliver (e.g., Marwell and Ames (1979;1980), Alfano and Marwell (1980), Oliver (1980), Marwell and Oliver (1984), Oliver and Marwell (1985;1988)). Much of this research has drawn upon Olson's (1965) work. (Also see R. Hardin, 1982; Ostrom and Ostrom, 1977; Ostrom, 1977; Runge, 1986.)

Olson's work involved an analysis of how people come to join organizations, and what factors determine collective action on the part of group members. His analysis parallels that of the "Tragedy of the Commons" as elaborated by Garrett Hardin (1968). The central themes of Olson's work are, that there is often a discrepancy between an individual's self-interest in contributing to a public good and his/her interest in the public good being maintained; and further, there are qualitative differences in the reward structure for group-oriented actions for individuals belonging to small groups, as compared with those who belong to larger groups. Olson discusses a number of historical cases outlining the evidence for, and against, this theory. His analysis is more sophisticated than that of Hardin's, but the conclusion he draws is similar: if collective action toward some common good is to be achieved, it must be in the individual's interest to join in. This can be achieved by creating a reward structure in which self-interest overlaps with group interests, or by implementing a system of coercion which induces individuals to engage in group-oriented action. The significance of this work to the present discussion is that it suggests an emphasis that could be explored more fully. Olson's theory could be explored in a real world commons by conducting a number of case histories of groups involved in resource commons.

Alternatives to the Present Research Strategy: Methodological Considerations

The following is a discussion some alternative strategies I would employ, if this project were to be further refined. The foremost of these, is that the survey of commercial fishers should be conducted entirely on an interview basis. My impression is that conducting face-to-face interviews would have resulted in a higher response rate, and more complete information - for the commercial fishers at least. I approached commercial fishers while they were working on their boats and getting ready for an opening. They were quite busy, and answering a questionnaire was probably somewhat of an imposition on their time. Also, it was my impression that people found completing a questionnaire by hand more demanding than verbally responding to questions.[3] The limited research that has been conducted comparing studies which used mail-questionnaires with those that employed face-to-face interviews, support these assertions (Bailey, 1982). The status of the researcher is also an important consideration for people's compliance in being interviewed (Bailey, 1982). People seemed quite enthusiastic when I told them I was a student. They were less so, when I told them I was collecting this information for a research organization. As can be discerned from the data, commercial fishers in particular, are extremely distrustful of D.F.O. officials. Even though I told the respondents I was in no way connected with the D.F.O., some feared the information I was compiling could be used by the D.F.O. against them. In sum, the response rate to the survey-interview would probably have gone up by at least 20% with commercial fishers if I had conducted structured interviews rather than a written questionnaire survey, and if my status was that, ironically, of

an M.A. student collecting data for his thesis. If this research were to be carried further, I might also consider working on a boat as a deck hand for some period of time in order to explore the phenomenology of the fishery.

Attempting to elicit responses from sport fishers presented different problems. They were generally in a hurry to get somewhere (home, or out on the water), so a strategy of conducting face-to-face interviews with them, at least in the context of marinas, with a fairly lengthy questionnaire, would probably have increased the response rate somewhat, but not greatly.[4]

In future research I might try to measure frequency of communication, number of meetings attended, etc.. Further, if I was to conduct a network study I might explore network aspects of communications such as the "multiplexity of ties". For instance, it was observed that compared with non-members, commercial fishers who were members of a fishery-related social network not only communicated more with other fishers about fishing, and fishery policy, but also communicated more with fishers about other things. This suggests that people who were members of a fishery-related network had friendship ties with other fishers, in addition to business ties. With regard to the lab study, one way a more explicit network perspective might be incorporated into future research would be to contrast groups of friends with groups of strangers.[5] Other types of network contrasts might also be explored, including those based on social class, education, religion, and ethnicity.

Propects for Future Work

Cognition

Game theoretical, as well as many economic approaches to commons dilemmas are built on the assumption that humans are basically "rational". The results of work on cognitive biases (see Tversky, and Kahneman, 1974; Kahneman, and Tversky, 1982) seem to threaten the validity of this body of commons dilemma research. Findings from the present field-survey demonstrate people's self-serving biases in evaluating fairness, and in making attributions about themselves and foreign fishers. The data collected from the lab simulation suggest that there may be a discrepancy between what people think they are doing in commons dilemmas, and how they actually behave. Is the assumption that humans are largely rational flawed? Only close empirical examination of this issue, will provide the answer to this question, and much work is yet to be done. The fact is, that humans process information remarkably accurrately most of the time, depending on the measures employed.[6] The study of biases and errors is useful, though, in the sense that it helps us to understand how people process information.[7] Research on cognitive biases in laboratory and real world commons is likely to yield benefits in two ways. One, it will help us to understand how people process information in such situations. Two, it will allow us to gauge the limits of people's cognitive abilities to process information in such situations, and thus, will enable us to determine what role cognition plays in contributing to commons dilemmas.[8]

The perspective taken in the current research emphasizing cognitive rather than structural economic factors, is probably not the most smitful one in terms of explaining the greatest proportion of variance of behavor in commons dilemmas.

However, it is of substatial significance, and largely unstudied. This is an area which probably comprises a proportion of the variance in people's behavior: the variance that is routinely overlooked by economists.

Theory and Model Building

This paradigm is in need of a model which designates the different levels and types of components involved in commons dilemmas. During my early work, while developing an organizational scheme for the thesis, I attempted to construct a model of the commons dilemma depicting its various social and psychological components and their interrelations. In the interest of brevity I have abandoned completing this task for inclusion in the thesis. The commons dilemma has been studied by social psychologists through gaming approaches, largely in a variable analysis fashion (e.g., examining group size, communication, age, territories, visibility). This has left the paradigm soemwhat devoid of theory, and has led it to exclude consideration of complementary aspects of the problem such as social structure. The influences of networks on individuals in commons dilemmas, as suggested by the present findings, point to the need for the development of a broader social science model of the commons dilemma.

As alluded to above, social psychological research on the commons problem lacks an integrative theory. A number of theories have been proposed. These have tended to focus either on the micro-level (e.g. social trap, limited cognitive processing, equity theory, game theory) or on the macro-level (tragic choice theory). A social network approach, as outlined in my thesis, might be a useful bridging perspective for linking theory and research on micro behavior to macro social structural considerations. In the theory section of the thesis I have

outlined how social networks may be of relevance to equity theory, and to cognitive processing. With regard to social trap theory, it was noted, that social networks can provide a powerful context for modifying and regulating behavior based on reinforcement.

Gartrell's theoretical and empirical work may be instructive for future research along this route of inquiry. Gartrell (1987) has outlined how social networks are relevant to social evaluation theories such as reference groups, social comparison, distributive justice, and relative deprivation; as well as to substantive applications such as research on class consciousness, diffusion of innovations, and social support. I have discussed how the application of social network analysis to many of these areas also converges on issues relevant to the commons problem.

A potentially fruitful tack for future research to take would be to follow the model of Gartrell's (1982) work. An explicit network and social evaluation approach might be applied to real world commons problems. The example of the Pacific salmon fishery, as discussed earlier, would be an excellent choice for this application. In particular, it might be useful to engage this type of network approach in a small fishing community. Research questions that might be explored include: With whom do fishers compare about their annual income (other fishers, people outside the fishing industry, co-workers, friends, family, job related acquaintances, etc.)? With whom do they discuss the Department of Fisheries and Oceans' policies? Who do they talk to about fishing (gear, success, weather, compliance with the regulations, etc.)? For distributive justice issues, who do individual fishers consider to be their reference groups (all commercial fishers, only fishers using their gear type, people who operate small businesses, etc.)?

What level of class consciousness exists in the fishery? How is class imagery generated? Do other forms of social identity play a role in the commons (e.g., ethnic or religious groups)? With whom do fishers discuss political concerns? How do fishers cognitively balance their need to catch fish and generate income with the importance of preserving the resource? Who do fishers discuss this issue with? Are fishers relatively independent, or are they organized in cliques; for instance do they stay in constant radio communication with certain "buddies" to inform them about fishing conditions, and other pertinent information? How do fishers come to evaluate the state of salmon stocks, and the general quality of the coastal environment (through personal experience, from D.F.O. information, by discussing these issues with colleagues, from their association or union, through the media, etc.)? Other common resources in B.C. that might be explored include those pertaining to agriculture and forestry.

The question of social identity might be incorporated into this line of field research. Subjects could be asked what groups they identify with regarding the fishery. They may identify with a group other than their social class, as defined by economic relations. For instance, they may identify with an ethnic, religious, or political group. This is an empirical question.[9]

Another social network consideration in the commons is that of examining how resource relevant ideologies are disseminated and fostered. As noted earlier, independence (free enterprise) is the dominant ideology of the Pacific salmon fishery. In my study, fishers who were members of a fishery association placed even greater value on the ideal of freedom. This observation lends some support to the notion that resource relevant ideologies are propagated in social groups.

This conclusion has important implications for solving commons dilemmas. One possible strategy for attempting to solve commons dilemmas would be to make use of group processes as a conduit for transmitting information about such dilemmas, and social values that might help to protect shared limited resources.

Many of these issues could be explored in the context of people's social networks. There are two levels of networks that could be explored. Individuals' personal networks could be examined, which might entail finding out who an individual has business and friendship ties with (as well as other types of social ties), and whether these ties are uniplex or multiplex. Further, the social network of a small community could be mapped out. This would allow the researcher to detect cliques, the density of the network, and other structural considerations; such as how the relative location of individuals in the network influences their social evaluations. Block modelling is one mathematical technique that might be employed in this type of research.[10]

Conclusions

Social networks can influence their members in a number of ways. It appears from my own work, as well as in the related social psychological research literature, that networks provide the context in which people compare their shares of a resource and make evaluations about fairness or justice. Network characteristics may influence these evaluation processes in important ways. Evaluations can be made about social systems designed for allocating shared limited resources, or with regard to patterns of resource use itself. People can evaluate their inputs and outcomes vis 'a vis the inputs and outcomes of others

belonging to a membership or comparison reference group concerning a collective resource. The size and structure of social networks within which people engage in these processes can constrain, or facilitate such processes, partially by determining the flow (quality and quantity) of information about shared limited resources, and about others in the social system.[11] Game theory can suggest what is rational for individuals based on their self-interests in the context of given structural situations, and gaming approaches can contrast these choices (rational action based on self-interest and the structure of the situation) with observed behavior.

People do not always have access to perfect information about resource dynamics. Further, people are not perfect processors of information. There are a number of systematic biases people make when perceiving both the physical and social world (see Fiske and Taylor, 1984). Thus, the consciousness of an actor in a collective dilemma, and his or her subsequent action, is determined partly by the structure of a given dilemma situation, and the information that is available to that individual about the situation; partly by limited cognitive processing capabilities; partly by the evaluations he or she makes based on these factors; and of course, partly by other individual factors such as personality. These factors are probably involved in all collective dilemmas to varying extents. To understand a specific dilemma, however, it is necessary to examine its distinct characteristics. The results of my field-survey suggested ways in which network processes may be linked to cognition and behavior at the individual level in commons dilemmas; and how this problem could be further studied from an explicitly social network analysis framework. The findings from my laboratory study support the conclusion

that social identity can influence people's behavior in commons dilemmas in certain conditions. If policy makers are to prevent "the tragedy of the commons" from occurring, it would seem extemely important for them to gain an understanding of the processes and structures involved in commons dilemmas, and integrate these insights into policy decisions. The answers to many of the questions raised in this thesis could eventually lead both to applications for government policy, and implications for pure research and theory development within the commons dilemma paradigm.

Notes

1 The following summary provided by Turner (1982:36) may help to clarify the overlap between the examination of social groups and categories (as employed in study #1) and social identity (as employed in study #2):

> ... from a social psychological perspective, a social group can be usefully conceptualized as a number of individuals who have internalized the same social category membership as a component of their self-concept. ... group behavior can be seen as causally dependent on the functioning of such shared social evaluations.

2 Both economists and game theorists usually define rationality in terms of self interest.

3 The example of the ease and incidence of phone calls to friends and family compared with letter writing comes to mind.

4 Someone suggested I might have left copies of the questionnaire in sporting goods stores where people bought sport fishing licenses. This may be a useful strategy for collecting information, but the characteristics of the sample relative to the popuation would be unknown. Nonetheless this would be no worse than the present situation.

5 As noted earlier, Yamagishi and Sato (1986) have employed this contrast in a laboratory study of the public goods problem. They did not, however, incorporate specific network measures in their research design.

6 Psychologists such as Tversky and Kahneman often have to go to great lengths in artificial environments to produce systematic errors.

7 Funder (1987) argues that laboratory research on "error" in social judgements has been overemphasized when compared with research that examines accuracy issues more directly. This research is highlighted, he maintains, because of what many authors take to be its dismal implications for the accuracy of human social reasoning. Funder argues that such implications are illusory, however, because an error is not the same thing as a "mistake". He defines an error as a judgment of an experimental stimulus that departs from a model of the judgment process. Funder argues that if this model is normative, then the error can be said to represent an incorrect judgment. A mistake, on the other hand, is an incorrect judgement of a real world stimulus and therefore more difficult to determine. Funder notes that although errors can be highly informative about the process of judgment in general,

> they are not neccessarily relevant to the content or accuracy of particular judgements, because errors in a laboratory may not be mistakes with respect to a broader, more realistic frame of reference and the processes that produce such errors might lead to correct decisions and adaptive outcomes in real life. (1987:75)

Funder concludes that accuracy issues cannot be addressed by research that concentrates on demonstrating error in relation to artificial stimuli, but only by research that uses external, realistic criteria for accuracy. He suggests these criteria might include the degree to which judgments agree with each other and yield valid predictions of behavior.

8 Cohen's (1978) work suggests some implications for studying cognitive biases in the context of group processes. Cohen notes that one possible effect of focussing one's attention on a given stimulus is to oversimplify and distort perceptions of complex social relationships. He points out that it involves less effort to view the relationship between two groups as either clearly positive or clearly negative than it does to view the more subtle similarities and differences between groups. A similar distortion, he adds, can also occur in the perception of individuals. Thus, gross cues such as group membership may be overemphasized because effort is not available to process and interpret a wider range of information.

Cohen observes that a similar analysis can be used to study communication under conditions of overload. He argues that the focusing of attention on a major theme, and consequent neglect of the more subtle nuances, can result in a gross distortion of a communication especially when it is complex or includes qualifications. He adds that, although such distortion under conditions of overload poses a major problem in formal communication networks, the social implications of such phenomena include the effect of overload on the transmission of rumors and other informal intra- and intergroup messages. This latter observation suggests further implications for examining the commons problem from a social network perspective.

9 Another issue to be explored in this context would be the degree to which people are connected by social ties to the groups they psychologically identify with.

10 Block modelling is a technique that might be used to explore the relation between individuals' structural locations and their social evaluations (e.g. see

Gartrell, 1985).

11 For instance, the larger the number of people in a social network, the less obvious a given individual's actions in contributing to the state of a particular resource become. In addition to size, the structural characteristics of a network should have an affect on the dispersal of information. The proximity of individuals to key others (for instance, central figures in a clique) may be important in the dispersal of information relevant to behavior in commons/social dilemmas. Other network characteritics such as density may also be implicated in influencing the flow of information in such dilemmas.

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APPENDIX A

COMMERCIAL FISHER QUESTIONNAIRE ITEMS*

P.I.R.G. - WESTCOAST SALMON FISHERIES RESEARCH QUESTIONNAIRE
FOR COMMERCIAL FISHERMEN

The P.I.R.G. or Public Interest Research Group is an organisation funded and operated by university students. Its purpose is to conduct research on topics that are of concern to the general public, and to give students an opportunity to utilize and enhance their research, and administrative skills - and to provide a liason between sources of specialized knowledge and the community.

The purpose of this questionnaire is to study the social aspects of the west coast salmon fishery, in particular the perceptions and attitudes of those involved in the fishery. It is hoped that the results of this questionnaire will help to shed light on the complicated process of how people think, and interact with one another with regards to a natural resource - such as Pacific salmon. A report will be written based on the findings of this, and two other (similar) questionnaires.

NOTE: WE ARE NOT EMPLOYED BY
THE DEPARTMENT OF FISHERIES AND OCEANS

We would greatly appreciate it if you would answer the following questionnaire to the best of your ability. Your responses will remain anonymous, and the answers you provide will help the researcher better understand the nature of this process. Please answer according to your true feelings.

DO NOT PUT YOUR NAME ON ANY PART
OF THE QUESTIONAIRE OR ENVELOPE.

Please place the completed questionnaire in the envelope provided. Seal the envelope and return it to the researcher, or mail it to the P.I.R.G. address (given on the outside of the envelope).

YOUR PARTICIPATION IS STRICTLY VOLUNTARY
REMEMBER, ALL YOUR RESPONSES WILL REMAIN ANONYMOUS

1.) How long is your boat? _____ feet.

2.) How many crew members are there on your boat? ___

3.) Which zone do you fish? (inside or outside area)

4.) What type(s) of salmon did you fish for (last year)?

Sockeye ___ % / Pink ___ %

Coho ___ % / Chinook ___ %

5.) Do you fish for other species? Yes _ No _

If yes, what other species

Roe Herring _ Groundfish _ Halibut _ Other _

6.) What type of gear do you use?

Seine ___ Troll ___ Gillnet ___ Other ___

7.) Approximately how many pounds of salmon did you catch last year? ____

8.) Approximately how many pounds of other fish did you catch last year? ___

9.) Are you a Native Indian? ___

10.) What level of education have you received? ___

11.) Do you belong to an association? (yes or no) If yes, which one?

12.) Are you an active member?

13.) Do you go to meetings?

14.) Do you plan to stay in fishing?

15.) Do you personally know of other fishermen who do not always comply with the regulations? (yes or no)

16.) Should there be a limit on the number of salmon you can take? (yes or no)

17.) Should there be limited entry - in obtaining a commercial salmon fishing license? (yes or no)

18.) Is there undue favoritism towards certain fishing groups by the Department of Fisheries and Oceans? (yes or no)

If yes, which group(s):

Seiners ___
Trollers ___
Gillnetters ___
Sport Fishermen ___
Native Indians ___

19.) Approximately, how many salmon fishermen do you think there are in the zone (inside, or outside area) you fish?

Seiners ___
Trollers ___
Gillnetters ___
Sport Fishermen ___

20.) Please estimate the percentage of other fishermen that you think follow the fishing regulations closely ___ %

21.) Do you tell the truth to other fishermen about how many fish you take? (how often)

22.) Do you think other fishermen tell the truth about how many fish they catch? (how often)

* *

For question 23 to 48 please rate on the following scales by placing a pencil mark on the section of the line that you feel best describes your answer to each question. For example:

How big was the fish you caught?

/------/------/------/------/------/------/------/------/------/

extremely small — extremely large

* *

23.) How satisfied with fishing - as an occupation - are you?

/------/------/------/------/------/------/------/------/------/

extremely satisfied — extremely unsatisfied

24.) How successful would you rate yourself as a fisherman?

/------/------/------/------/------/------/------/------/------/

extremely successful — extremely unsuccessful

25.) In general, how would you rate the environmental quality of B.C.'s rivers and streams?

/------/------/------/------/------/------/------/------/------/

extremely clean — extremely polluted

26.) In general, how would you rate the environmental quality of B.C.'s coastal waters?

/------/------/------/------/------/------/------/------/------/

extremely clean — extremely polluted

27.) How do you perceive the present state of B.C. salmon stocks?

/------/------/------/------/------/------/------/------/------/

dangerously depleted — virtually unlimited

28.) How much harm do you think foreign fishing fleets do to the stocks of B.C. salmon?

/------/------/------/------/------/------/------/------/------/

extreme damage — no significant effect

29.) Should catch limits be stringently enforced or voluntarily enforced?

/------/------/------/------/------/------/------/------/------/

voluntarily enforced — stringently enforced

30.) Should fishermen be free to catch as many fish as they can, or should the fishery be regulated so as to ensure relatively equal catches?

/------/------/------/------/------/------/------/------/------/
free equal

31.) Please rate your political attitudes on the following scale. In general, do you believe in:

/------/------/------/------/------/------/------/------/------/
socialism free enterprise

32.) How much pressure to cooperate (not break fishing regulations) do you feel from the government?

/------/------/------/------/------/------/------/------/------/
extreme pressure no pressure

33.) How much pressure to cooperate (not break fishing regulations) do you feel from society?

/------/------/------/------/------/------/------/------/------/
extreme pressure no pressure

34.) If you broke the regulations what are the chances that you would get caught?

/-----/-----/-----/-----/-----/-----/-----/-----/-----/-----/
0% 100%

35.) How harmful (to the salmon stocks) do you think it is if you take a small catch of salmon illegally?

/------/------/------/------/------/------/------/------/------/
relatively no effect extremely harmful

36.) How guilty would you (do you) feel if you significantly broke the fishing regulations?

/------/------/------/------/------/------/------/------/------/
extremely guilty no feelings of guilt

37.) In general, how effective is government Fisheries policy?

/------/------/------/------/------/------/------/------/------/

extremely effective — extremely ineffective

38.) How fair to Canadian salmon fishermen was the recent salmon fishing treaty signed by Canada and the United States?

/------/------/------/------/------/------/------/------/------/

extremely fair — extremely unfair

39.) How much do you trust other fishermen?

/------/------/------/------/------/------/------/------/------/

extreme trust — extreme distrust

40.) How much do you trust the Department of Fisheries and Oceans?

/------/------/------/------/------/------/------/------/------/

extreme trust — extreme distrust

41.) How anonymous do you feel about the number of fish you take (do you think others - including the Fisheries Dept. - know approximately how many fish you catch, and sell)?

/------/------/------/------/------/------/------/------/------/

extremely anonymous — extremely public

42.) How much do you communicate with other fishermen about fishing?

/------/------/------/------/------/------/------/------/------/

extremely often — extremely seldom

43.) How much do you communicate with other fishermen about Fisheries policy?

/------/------/------/------/------/------/------/------/------/

extremely often — extremely seldom

44.) How much do you communicate with other fishermen about things other than fishing?

/------/------/------/------/------/------/------/------/------/

extremely often — extremely seldom

45.) How would you rate the quality of information you receive from the Fisheries Department?

/------/------/------/------/------/------/------/------/------/

extremely good — extremely poor

46.) Would you say that the fisheries Dept. behaves the way it does because of:

/------/------/------/------/------/------/------/------/------/

its own independent intentions and characteristics — because of the situation it must deal with

47.) Would you say that Canadian fishermen behave the way they do because of:

/------/------/------/------/------/------/------/------/------/

their own independent intentions and characteristics — because of the situation they must deal with

48.) Would you say that foreign fishing fleets (fishermen) behave the way they do because of:

/------/------/------/------/------/------/------/------/------/

their own independent intentions and characteristics — because of the situation they must deal with

49.) Would you say that you behave the way you do because of:

/------/------/------/------/------/------/------/------/------/

your own independent intentions and characteristics — because of the situation you must deal with

50.) Does government policy increase or decrease conflict?

51.) Should fisheries policy attempt to decrease competitiveness between individual fishermen? (please give a brief explanation for your answer)

52.) How could fisheries policy decrease competitiveness between different fishing groups? (or should they?)

53.) We would appreciate any additional positive or negative comments you can give, please feel free to elaborate on anything that you wish to express an opinion on with regards to the westcoast salmon fishing industry, and the Department of Fisheries and Oceans (if required, ask me for additional paper):

***Note:** The rating scale items were scored in the following manner: an X marked in the first line segment corresponded to one, an X in the second line segment corresponded to two, and so on (see below).

/--1--/--2--/--3--/--4--/--5--/--6--/--7--/--8--/--9--/

APPENDIX B

SPORT FISHER QUESTIONNAIRE ITEMS*

P.I.R.G. - WESTCOAST SALMON FISHERIES RESEARCH QUESTIONNAIRE
FOR SPORT FISHERMEN

The P.I.R.G. or Public Interest Research Group is an organisation funded and operated by university students. Its purpose is to conduct research on topics that are of concern to the general public, and to give students an opportunity to utilize and enhance their research, and administrative skills - and to provide a liason between sources of specialized knowledge and the community.

The purpose of this questionnaire is to study the social aspects of the west coast salmon fishery, in particular the perceptions and attitudes of those involved in the fishery. It is hoped that the results of this questionnaire will help to shed light on the complicated process of how people think, and interact with one another with regards to a natural resource - such as Pacific salmon. A report will be written based on the findings of this, and two other (similar) questionnaires.

NOTE: WE ARE NOT EMPLOYED BY
THE DEPARTMENT OF FISHERIES AND OCEANS

We would greatly appreciate it if you would answer the following questionnaire to the best of your ability. Your responses will remain anonymous, and the answers you provide will help the researcher better understand the nature of this process. Please answer according to your true feelings.

DO NOT PUT YOUR NAME ON ANY PART
OF THE QUESTIONAIRE OR ENVELOPE.

Please place the completed questionnaire in the envelope provided. Seal the envelope and return it to the researcher, or mail it to the P.I.R.G. address (given on the outside of the envelope).

YOUR PARTICIPATION IS STRICTLY VOLUNTARY
REMEMBER, ALL YOUR RESPONSES WILL REMAIN ANONYMOUS

1.) Are you a resident of the Greater Victoria Area?

If not, how far did you have to travel for this fishing trip?

2.) Do you usually fish alone or with friends, or with family members? (Circle the appropriate answer(s))

3.) Where do you usually fish?

4.) What type(s) of salmon did you fish for (last year) ?

Sockeye ___ % / Pink ___ %

Coho ___ % / Chinook ___ %

5.) Do you fish for other species? Yes _ No _

If yes, what other species?

6.) What type of gear do you use most often?

7.) Approximately how many days did you fish last year? ___

8.) Approximately how many salmon did you catch last year? ___

9.) Approximately how many other fish did you catch last year? ___

10.) Are you a Native Indian? ___

11.) What level of education have you received? ____

12.) Do you belong to an association? (yes or no)

If yes, which one?

13.) Are you an active member?

14.) Do you go to meetings?

15.) From the list below, please place a check mark beside the 3 responses that best describe why you go fishing?

Good fishing available ___

Fair fishing available ___

To take family and/or friends out ___

To be outdoors ___

To get a change from working pressures ___

To get a change from home pressures ___

For solitude ___

Travelling to and from the fishing site ___

To take it easy and get rid of tension ___

To do something different ___

To enjoy the scenery ___

The experience of a catch ___

To have fresh fish to eat ___

Other (Please specify) ___

16.) Do you personally know of other fishermen who do not always comply with the regulations? (yes or no)

17.) Should there be a limit on the number of salmon you can take? (yes or no)

18.) Should there be limited entry - in obtaining a commercial salmon fishing license? (yes or no)

19.) Is there undue favoritism towards certain fishing groups by the Department of Fisheries and Oceans? (yes or no)

If yes, which group(s):

Seiners ___

Trollers ___

Gillnetters ___

Sport Fishermen ___

Native Indians ___

20.) Please estimate the percentage of other fishermen that you think follow the fishing regulations closely ___ %

21.) Do you tell the truth to other fishermen about how many fish you take? (how often)

22.) Do you think other fishermen tell the truth about how many fish they catch? (how often)

* *

For question 23 to 48 please rate on the following scales by placing a pencil mark on the section of the line that you feel best describes your answer to each question.

For example:

How big was the fish you caught?

/------/------/------/------/------/------/------/------/------/

extremely small — extremely large

* *

23.) How satisfied with fishing - as a recreational pastime - are you?

/------/------/------/------/------/------/------/------/------/

extremely satisfied — extremely unsatisfied

24.) How successful would you rate yourself as a fisherman?

/------/------/------/------/------/------/------/------/------/

extremely successful — extremely unsuccessful

25.) In general, how would you rate the environmental quality of B.C.'s rivers and streams?

/------/------/------/------/------/------/------/------/------/

extremely clean — extremely polluted

26.) In general, how would you rate the environmental quality of B.C.'s coastal waters?

/------/------/------/------/------/------/------/------/------/

extremely clean — extremely polluted

27.) How do you perceive the present state of B.C. sockeye salmon stocks?

/------/------/------/------/------/------/------/------/------/

dangerously depleted — virtually unlimited

28.) How do you perceive the present state of B.C. pink salmon

/------/------/------/------/------/------/------/------/------/

dangerously depleted — virtually unlimited

29.) How do you perceive the present state of B.C. coho salmon stocks?

/------/------/------/------/------/------/------/------/------/

dangerously depleted — virtually unlimited

30.) How do you perceive the present state of B.C. chinook salmon stocks?

/------/------/------/------/------/------/------/------/------/

dangerously depleted — virtually unlimited

31.) How much harm do you think foreign fishing fleets do to the stocks of B.C. salmon?

/------/------/------/------/------/------/------/------/------/

extreme damage — no significant effect

32.) Should catch limits be stringently enforced or voluntarily enforced?

/------/------/------/------/------/------/------/------/------/

voluntarily enforced — stringently enforced

33.) Please rate your political attitudes on the following scale. In general, do you believe in:

/------/------/------/------/------/------/------/------/------/
socialism free enterprise

34.) How much pressure to cooperate (not break fishing regulations) do you feel from the government?

/------/------/------/------/------/------/------/------/------/
extreme pressure no pressure

35.) How much pressure to cooperate (not break fishing regulations) do you feel from society?

/------/------/------/------/------/------/------/------/------/
extreme pressure no pressure

36.) If a fisherman broke the regulations what do you estimate the chances are that he would get caught?

/-----/-----/-----/-----/-----/-----/-----/-----/-----/
0% 100%

37.) How harmful (to the salmon stocks) do you think it is if you take a small catch of salmon illegally?

/------/------/------/------/------/------/------/------/------/
relatively no effect extremely harmful

38.) How guilty would you feel if you significantly broke the fishing regulations?

/------/------/------/------/------/------/------/------/------/
extremely guilty no feelings of guilt

39.) In general, how effective is government Fisherires policy?

/------/------/------/------/------/------/------/------/------/
extremely effective extremely ineffective

40.) In general, how much do you trust other fishermen with regard to the information they give you about fishing?

/------/------/------/------/------/------/------/------/------/

extreme trust — extreme distrust

41.) In general, how much do you trust the Department of Fisheries and Oceans with regard to the information that they give you about the salmon fishery?

/------/------/------/------/------/------/------/------/------/

extreme trust — extreme distrust

42.) How much do you communicate with other fishermen about fishing?

/------/------/------/------/------/------/------/------/------/

extremely often — extremely seldom

43.) How much do you communicate with other fishermen about Fisheries policy?

/------/------/------/------/------/------/------/------/------/

extremely often — extremely seldom

44.) How much do you communicate with other fishermen about things other than fishing?

/------/------/------/------/------/------/------/------/------/

extremely often — extremely seldom

45.) How would you rate the quality of information you receive from the Fisheries Department?

/------/------/------/------/------/------/------/------/------/

extremely good — extremely poor

46.) Would you say that Canadian commercial fishermen behave the way they do because of:

/------/------/------/------/------/------/------/------/------/

their own independent intentions and characteristics — because of the situation they must deal with

47.) Would you say that Canadian sport fishermen behave the way they do because of:

/------/------/------/------/------/------/------/------/------/

their own independent intentions and characteristics — becasue of the situation they must deal with

48.) Would you say that you behave the way you do because of:

/------/------/------/------/------/------/------/------/------/

your own independent intentions and characteristics — because of the situation you must deal with

49.) Does government policy increase or decrease conflict?

50.) How could fisheries policy decrease competitiveness between different fishing groups? (or should they?)

51.) We would appreciate any additional positive or negative comments you can give, please feel free to elaborate on anything that you wish to express an opinion on with regards to the westcoast salmon fishing, and the Department of Fisheries and Oceans (if required, ask me for additional paper):

***Note**: The rating scale items were scored in the following manner: an X marked in the first line segment corresponded to one, an X in the second line segment corresponded to two, and so on (see below).

/--1--/--2--/--3--/--4--/--5--/--6--/--7--/--8--/--9--/

APPENDIX C

SIMULATION QUESTIONNAIRE ITEMS*

PLEASE DO NOT PUT YOUR NAME ON THIS FORM

COMMONS DILEMMA GAME
QUESTIONAIRE

Please answer the following question to the best of your ability. Your responses will be anonymous. If you would like to know more about any of the questions below, please feel free to ask the experimenter about them when you are finished.

For the rating scale questions, please respond by placing a pencil mark on the section of the line that you feel best describes your answer to each question. For each question just indicate your first impression, do not bother thinking about it for too long.

4.) How well do you feel you understood the principles of this game?

/------/------/------/------/------/------/------/------/------/
not at all extremely well

5.) Did your own performance influence the outcome of the game?

/------/------/------/------/------/------/------/------/------/
no influence total influence

6.) Did the other players'performance influence the outcome of the game?

/------/------/------/------/------/------/------/------/------/
no influence total influence

7.) During the game, how much did you trust that the other players would play cooperatively?

/------/------/------/------/------/------/------/------/------/
extreme trust extreme distrust

8.) How fair or unfair were the other players?

/------/------/------/------/------/------/------/------/------/
extremely fair extremely unfair

9.) How fair or unfair were you?

/------/------/------/------/------/------/------/------/------/
extremely fair extremely unfair

10.) Would you describe your political attitudes as:

(Place a check mark beside the appropriate label.)

socialist ___ liberal ___ conservative ___

Other ___ (please fill in) _____

11.) How important was the potential monetary reward to you?

/------/------/------/------/------/------/------/------/------/

totally insignificant — very significant

16.) In playing this game did you think of yourself as:

/------/------/------/------/------/------/------/------/------/

an individual — a group member

17.) In playing this game did you feel that you should:

/------/------/------/------/------/------/------/------/------/

try to catch as many fish as desired — take only your own (equal) share of fish

18.) How "greedy" were you in taking fish?

/------/------/------/------/------/------/------/------/------/

not greedy at all — extremely greedy

19.) Were you worried that the other players would take more than their fair share of fish?

/------/------/------/------/------/------/------/------/------/

not worried at all — very worried

20.) During your youth, who did your father/mother work for? (e.g. a government department or ministry; a large company; a small business; an institution; a service; themselves; etc.)

father: _____ mother: _____

21.) With regard to the above question, please briefly describe what your parents did/do.

***Note:** The rating scale items were scored in the following manner: an X marked in the first line segment corresponded to one, an X in the second line segment corresponded to two, and so on (see below).

/--1--/--2--/--3--/--4--/--5--/--6--/--7--/--8--/--9--/

APPENDIX D

CLASSIFICATION SCHEME FOR SOCIAL CLASS BACKGROUND

Bourgeousie

An individual was a member of the bourgeoise (a capitalist) if they owned a large business (they employed at least ten other people).

Managers

A person was a member of the managers class location, if s/he was not self-employed, but had a substantial level of authority over other employees. The level of authority a person had, based on this data, is difficult to determine. Often, however, subjects described a parent as a "manager", and people identified in this manner were coded into the managers class. Other indicators were descriptions such as "he ran a business ...", or "he was an administrator ... ", etc..

Supervisors

A person was a member of the supervisor's class location, if s/he was not self-employed, and had a moderate to low level of authority over other employees. Again, people often described a parent's work as "supervising", or described a parent as a "supervisor".

Semiautonomous Employees

A person was classified as a semiautonomous employee, if s/he was not self-employed, did not have authority over other employees (or had a very low level of authority) but had substantial autonomy over his/her own work. Again, the level of autonomy a person had based on this data, is difficult to ascertain with a great deal of precision. Most professionals (e.g.: lawyers, doctors, university professors, engineers, etc.) were classified as semiautonomous employees, unless the subject's description indicated that they were involved in a management or supervisory capacity. School teachers were also classified as semiautonomous employees. Nurses were classified as workers, semiautonomous employees, supervisors, or managers depending on the description of their qualifications (e.g. registered vs. non-registered) and the description of their position or duties, (e.g. "head nurse"). Semiautonomous employees were the most difficult group to categorize, because of the lack of detailed information about people's authority relations with other employees, and the level of autonomy they had over their own work. Some of the people classified as semiautonomous employees should probably been classified as managers or supervisors, and others as workers.

Petty Bourgeoise

People were classified as petty bourgeoise if they were self-employed, but did not have authority over (or employ) others.

Small Employers

People were classifed as small employers if they were self-employed/owned their own business, and had authority over (employed) between one and nine other employees.

Workers

People who were employed but did not fall into any of the above categories, were classified as workers.

Non-class Locations

In the present categorization scheme, there were two categories which represent non-class locations: homemakers, and non-class location (other than homemakers). Wright et al. (1978) in commenting on their classification scheme state:

> ... the typology presented here only decodes the class locations for the actively working population. A variety of locations in the social structure are thus ignored: housewives, students, retirees, etc. This is not to say that such locations have no class content, but simply that they are not directly organized within the structure of class relations. Such locations as Wright (1978:91ff) argues elsewhere, should be treated as having a mediated class content, i.e., their class character is determined by the various ways in which they are linked to the class structure through nonclass relations (familial relations, for example). For purposes of the empirical analysis of this paper we will exclude such locations. (Wright et al. 1982:710-711)

Homemakers

People who were not employed for wages, and were identified as homemakers, were classified as homemakers.

Non-class location (other than homemaker)

People who were not employed for wages and not homemakers were coded under this classification (e.g. people who did volunteer work).

Not Enough Information for Classification

Finally, people for whom there was insufficient information on, were classified as such.

Other Considerations with Classification Scheme

Some people fit more than one category, because they had different occupations over time (or simultaneously). In dealing with this problem I classified people on the basis of the following order of priorities: 1) the category on which the most information was provided - what appeared to be the dominant category in terms of time spent; 2) highest class category (in terms of authority over others and self-autonomy).

VITA

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