

Finding Emotions in the Drama of the Commons:
A multi-relational and multi-level analysis of the access
to fishery resources in the Loreto Bay Marine Park,
Baja California Sur, Mexico

Prepared by

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ABSTRACT

The sad ending of Hardin's "Tragedy of the Commons" has now been supplemented with a happy "Comedy of the Commons." Such "balance" has kept intact the "cold headed" rational individual responding to economic incentives mediated by the presence or lack of institutions. Drawing on research in the Loreto National Marine Park, I examine the role of different emotional relations in the cooperative behaviour for accessing fishery resources at the community, municipal and state levels. Results indicate that cooperative behaviour for accessing fisheries resources is strongly embedded in affective relations and widespread even under a *de facto* open access. Moreover, such emotionally engaged cooperation transcends individual attributes of occupation, locality and organizational levels, with important insights into the issues of resource users' heterogeneity and scale in the management of the commons. More generally, results support the thesis that emotions and reason are mutually complementary rather than exclusive, particularly when it comes to social facts such as human cooperation where positive emotions may be an essential element. If emotional bonds are a key force in cooperative behaviour, we should reconsider our theoretical stands and analysis regarding human cooperation, and how we go about promoting cooperative solutions for conservation of the commons through sustainable resource use.

INTRODUCTION

Hardin's metaphor of the tragedy of the commons has now been supplemented with the "drama of the commons" metaphor (Dietz et al. 2002). Indeed, despite the fact that to a great extent the scholarship on the commons has been aimed at refuting Hardin's contentions and moving away from rational-choice models of human behaviour, there is an irony in the way that scholars of the commons have constructed the conditions under which the use and over-use of common-pool resources occur. Namely, that locally devised cooperative solutions to the problems of the commons occur where rule- and cultural-based institutions regulate access and use while the lack of such governing institutions unleashes the individuals' maximizing, self-interested behaviour causing resource over-exploitation or suboptimal collective outcomes. This is the commons/tragedy of open-access distinction (Fenny et al. 1996, Mansfield 2001). Both metaphors, however, converge at least in one aspect: their neglect of human emotions and social relations for accessing and using the commons.

In this paper, I explore how social relations mediate cooperative behaviour for accessing fishery resources among resources users organized through different social categories, locations, and organizational levels in the Loreto Bay National Marine Park. The fisheries management system in the Loreto area has been characterized by a *weak* regulatory regime, *high* resource-dependence livelihoods, *poor* development of social organizations, *extreme* poverty, and signs of *over-exploitation* of extensive fishery resources. The decrease in catches of multiple fisheries stocks have been interpreted as the result of a *de facto* open-access where self-interest took the blame for this condition.

I used a social network analysis to account for the effect of social relations in the cooperative behaviour among resource users for accessing fishery resources belonging to various social categories, localities, and organizational levels. My main assumption is that sharing of information on both the state of fishery resources and the institutional environment is an important form of cooperation for accessing fishery resources. I consider a social behaviour between two individuals to be cooperative if the social behaviour of each is valuable to the other or to a third person. When the social cooperative behaviour involves goods it is called sharing and called participation when it involves activities (Bunge 1980).

The results indicate that cooperative behaviour among resource users is embedded in various types of social relations and relatively widespread despite of a *de facto* open access. Such social relations transcend social categories of occupation, locality and organizational levels suggesting that the structure and types of social relations may be more relevant to issues of resource users' heterogeneity and scale in the management of the commons. Overall, I argue that the decisions to engage in human social cooperation is underpinned by human emotions expressed as social relations of various types.

STUDY AREA

The Loreto Bay National Marine Park (LMP) is located on the western side of the Gulf of California, Mexico and covers an area of about 2065 km². It is situated within the Municipality of Loreto (Figure 1). LMP was created in 1996 after an influential group of local entrepreneurs directly requested the Mexican President to

help them protect their marine resources from poachers and non-resident shrimp trawling fleets. The overarching goal set out by the management plan is to protect and restore the park's natural resources and, at the same time, promote the social development of the communities adjacent to the park (CONANP 2002).

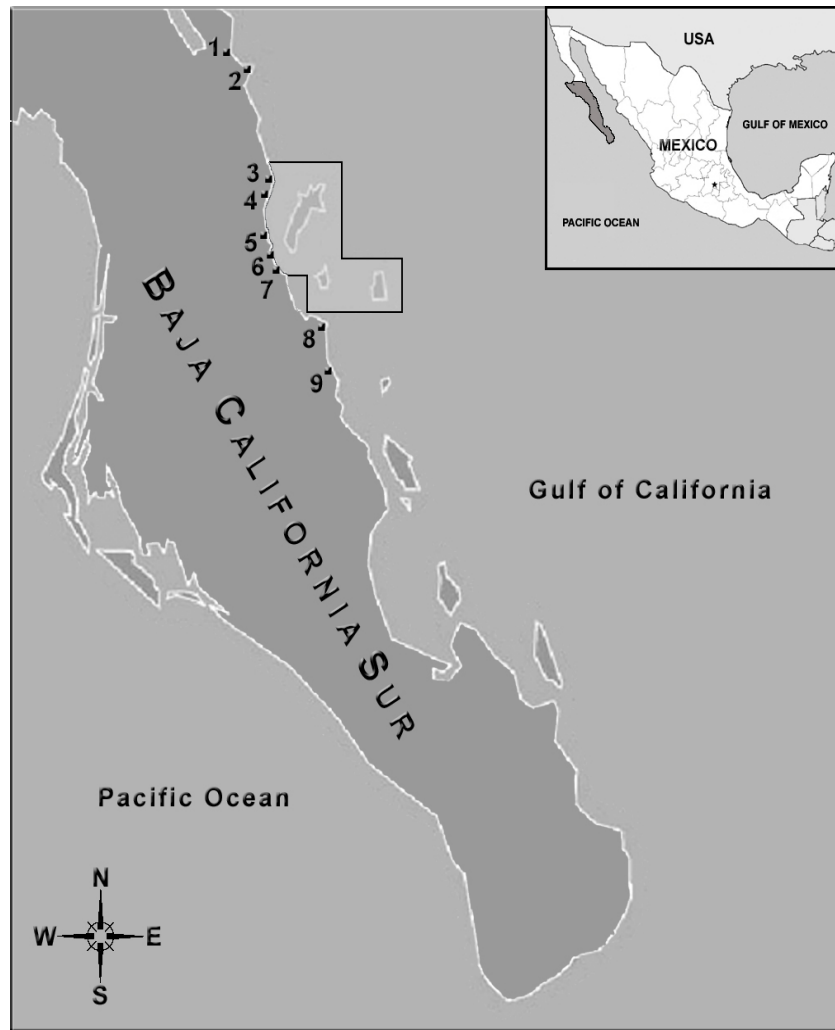


Figure 1: The Loreto Bay National Marine Park boundary is shown with a solid line. From North to South: 1. Ramadita (RM); 2. San Nicolás (SN); 3. Loreto (LT); 4. Colonia Zaragoza (CZ); 5. Juncalito (JC); 6. Ligüi (LG); 7. Ensenada Blanca (EB); 8. Agua Verde (AV); and 9. Tembabiche (TB). These are the main coastal communities in the Municipality of Loreto. In addition, Isla del Carmen (IC) is the major island within the park.

Tourism and fisheries are the main economic activities in the park. Small-scale fisheries, however, are a main concern to local authorities and park managers for their provision of livelihoods to the town of Loreto and eight coastal communities (Figure 1). Fishing is the main, and often only, economic activity available in these coastal communities. The number of fishers operating in the park is not precisely known, but a survey a few years ago by park staff estimated 326 fishers, some of which were organized into fishing cooperatives (Gutierrez-Barreras, 2001).

Commercial fisheries are multi-specific and may include several species of clam, conch, octopus, squid, Crustacea, shark, and finfish.

The state of fish stocks in the area is uncertain (Casas-Valdez and Ponce-Díaz 1996), but many have interpreted a decrease in the catches of some finfish species in the Loreto area as the result of a *de facto* open access where self-interest took the blame for the over-use of fishery resources. Rather than assuming self-interest and absence of cooperation among resource users I explore how social relations affect cooperative behaviour among resource users for accessing fishery resources from seven rural coastal communities adjacent to the LMP.

METHODS AND ANALYSIS

Fieldwork was conducted from January to April 2004. A survey questionnaire was used to obtain data on socio-economic and social networks data from seven of the nine coastal rural communities of the Loreto Municipality. Here I only report some of the data on social networks. The communities where I conducted my research include Ramadita, San Nicolás, Colonia Zaragoza, Juncalito, Ligüi,

Ensenada Blanca, Agua Verde (See Figure 1). These communities represent the main social system of my research but the relations to other localities within and outside the Loreto municipality were also considered. The localities outside the Loreto municipality were group according to municipality and included Mulegé, North of Loreto; Comundú, West of Loreto; and La Paz, South of Loreto.

Participants in the survey were identified with the help of local informants, and from the list of individuals mentioned by previous individual respondents (the same way it is done in a snowball sampling technique). General information on the fishing communities and activities was collected via participant observation.

Three questions were used to assess personal contacts on the state of fishery resources: Who do you consult to obtain trustworthy information regarding abundant fishing areas in (1) your community, (2) the other fishing communities of Loreto Municipality, and (3) other parts of BCS? And one question was used for the institutional environment (constraints and opportunities): (4) Who do you consult to obtain trustworthy information regarding fishing regulations such as fishing permits or closed and opened areas for fishing? These questions attempt to capture the different social relations available to fishers for accessing fishery resources, and it is assumed that the informant's consultation with trustworthy personal contacts represents cooperative behaviour whether or not this behaviour is reciprocated. There is no constraint on the number of people that an individual respondent can choose within these four relations (free choice design) except for in-community contacts where a list or roster with *all* known fishers was provided (Wasserman and

Faust 1998). Finally, the relational data were complemented by asking the individual respondent on relationship (e.g., friend, cousin, acquaintance, etc.), to each personal contact mentioned in each of the four questions.

In order to analyze the degree of embeddedness, an actor-by-actor socio-matrix for each social relation (i.e., for each of the above questions) was constructed and compared to various social networks generated from the social ties reported by the resource users.¹ Thus, three networks corresponding to access to local (referred to as Local Fisheries Network) and out of the municipality (referred to as Foreign Fisheries) fisheries were constructed as well as a network corresponding to the institutional environment (referred to as Fisheries Institutional Support). Four networks corresponding to kinship, friendship, acquaintance and impersonal relations were also constructed. Two more networks were created according to occupation and locality. Finally, all these networks were partitioned to reflect different organizational levels (i.e. intra-community, inter-community, municipal, and state levels) and different types of social relations (e.g. kinship, friendship) allowing for a multiple analysis at different organizational levels for different social relations.

The comparisons were made using a Quadratic Assignment Pearson Correlation (QAP-Correlation) and a randomization test of autocorrelation for a categorical variable as implemented in the UCINET suite of social network programs (Borgatti et al. 2002). The former statistical procedure determines the

¹ The socio-matrix or adjacency matrix is one of the primary formats used in social network analysis, where entries in the matrix indicate whether two actors are connected by a social tie.

degree of correlation of two networks, and assesses the probability that the correlation could have occurred by chance. The latter method relates a dyadic variable (an actor-by-actor matrix) to an individual attribute variable, and tests the hypothesis that a relational variable (e.g. sharing of information) is patterned by an individual attribute (e.g. occupation or community). The test is similar to performing an analysis of variance and is based on the densities (i.e. the proportion of existing ties by the possible number of ties among network members) within categorical (occupation and locality) blocks. Finally, I use graphical network representations to highlight the connections among occupations and localities.

RESULTS AND DISCUSSION

Network Composition

A total of 372 individuals were identified through interviewing 123 resource users from the seven rural communities. The overall composition of the social networks where the 372 individuals are partitioned according to occupation and locality at different organizational levels from the community through the municipal to the state levels is shown in Table 1. A total of 13 localities and 11 different occupations were identified. By itself network composition reveals little about the social system because it does not reflect the social relations among network members. However, some tendencies regarding the submergence and emergence of occupations and localities at different organizational levels are worth noticing. Most resource users are commercial fishers. There is a relatively high

Table 1: Composition of Merged Networks by community and occupation at different levels of organization

OCCUPATION	STATE LEVEL													TOTAL
	MUNICIPAL LEVEL													
	COMMUNITY LEVEL													
	Agua Verde	Colonia Zagoza	Ensenada Blanca	Junca-lito	Ligü-i	San Nicolás	Ramada	Loreto	Temabiche	Isla del Carmen	Comondú	Mulegé	La Paz	
Commercial Fisher	48	32	31	12	23	19	12	4	11	2	1	4	0	199
Fish Buyer/Permit Holder	4	3	2	0	1	3	0	13	0	0	10	9	3	48
Sport/Commercial Fisher	0	13	0	6	0	1	0	13	0	0	0	0	0	33
Diver/Commercial Fisher	0	0	9	1	8	4	0	0	0	0	3	2	0	27
Sport Fisher	0	0	0	0	0	0	0	21	0	0	0	0	0	21
Commercial/Sport Fisher	0	12	0	0	0	1	1	0	0	0	0	0	0	14
Diver	0	3	1	0	4	0	0	0	0	0	1	0	0	9
Resource Manager	0	0	0	0	0	0	0	7	0	0	0	0	0	7
Retired	0	0	2	1	3	0	0	0	0	0	0	0	0	6
Other	1	1	0	0	0	0	1	1	0	0	1	0	0	5
Government Employee	0	1	1	1	0	0	0	0	0	0	0	0	0	3
TOTAL	53	65	46	21	39	28	14	59	11	2	16	15	3	372
No. of Occupations	3	7	6	5	5	5	3	6	1	1	5	3	1	11

diversity of resource users' occupations of which the Colonia Zaragoza community is the most diverse. This may be because of its proximity to the town of Loreto that concentrates most of the economic activity in the municipality. In particular, the similar though distinct occupational categories of sport/commercial and commercial/sport fisher are among the most salient in Colonia Zaragoza after commercial fishers. This may be explained by the proximity of Colonia Zaragoza to the town of Loreto where most of the sport fishing activity in the municipality is concentrated as well as economic activity. Indeed, the town of Loreto is the only locality that registers the sport fishers and the resource manager categories. Further expanding the organizational scale (i.e. to the municipal and state levels) the diversity of occupations decreases. For instance, Tembabiche and Isla del Carmen, the two remaining localities within the municipality of Loreto, include only commercial fishers. Finally, most resource users involved in the social networks from other municipalities (i.e. Comondú, Mulegé, and La Paz) include mostly the occupation of Fish buyer/Permit holder. To what extent members from the different occupations and localities relate to each other through different social relations is analyzed in the next section.

Social Categories and Social Embedding

Relational sociologists notice that categorical models (e.g. race, social status, and social class, occupation, locality) alone rarely partition people in a way that confirms with observed action (Emirbayer 1997). To what extent is sharing of information among resource users structured by social categories of occupation and locality? I addressed this question by comparing actor-by-actor networks of locality and occupation with the Local and Foreign Fisheries, and the Fisheries Institutional Support Networks.

Locality

Among communities the randomization test of autocorrelation using locality as categorical variable shows that social relations are significantly stronger within than among the seven fishing communities for the three types of networks (Local and Foreign Fisheries, and Institutional Support Networks). At higher organizational levels (i.e. municipal and state levels) the QAP correlation tests also shows locality to be stronger within localities than among them. Thus, all organizational levels cooperative behaviour is stronger within localities than among communities. Despite this, resource users from the seven fishing communities are to various degrees connected to other localities. Figure 2 shows a graphical representation of a merged network that combines all three types of networks (i.e. local, foreign, and fisheries institutional support) where we can observe the emergent structure in terms of the relative connectedness among locations. From Figure 2 it can also be noticed that geographical proximity does not warranty more ties will be present between geographical close localities. In other words, spatial relations among localities are necessary but insufficient condition for the emergence of social ties. For instance, Colonia Zaragoza has more relations with Ramadita, Ligüi and Agua Verde, than with Loreto and Juncalito, even though the latter two are geographical closer to Colonia Zaragoza. It is also worth noticing how most communities are connected, except for the most extreme geographically located communities of Ramadita (to the north) and Tembache (to the south). Although this may suggest that there is a geographical threshold for ties to exist, this is not

supported by the fact that some resource users from the seven fishing communities have relations to other municipalities in Baja California Sur.

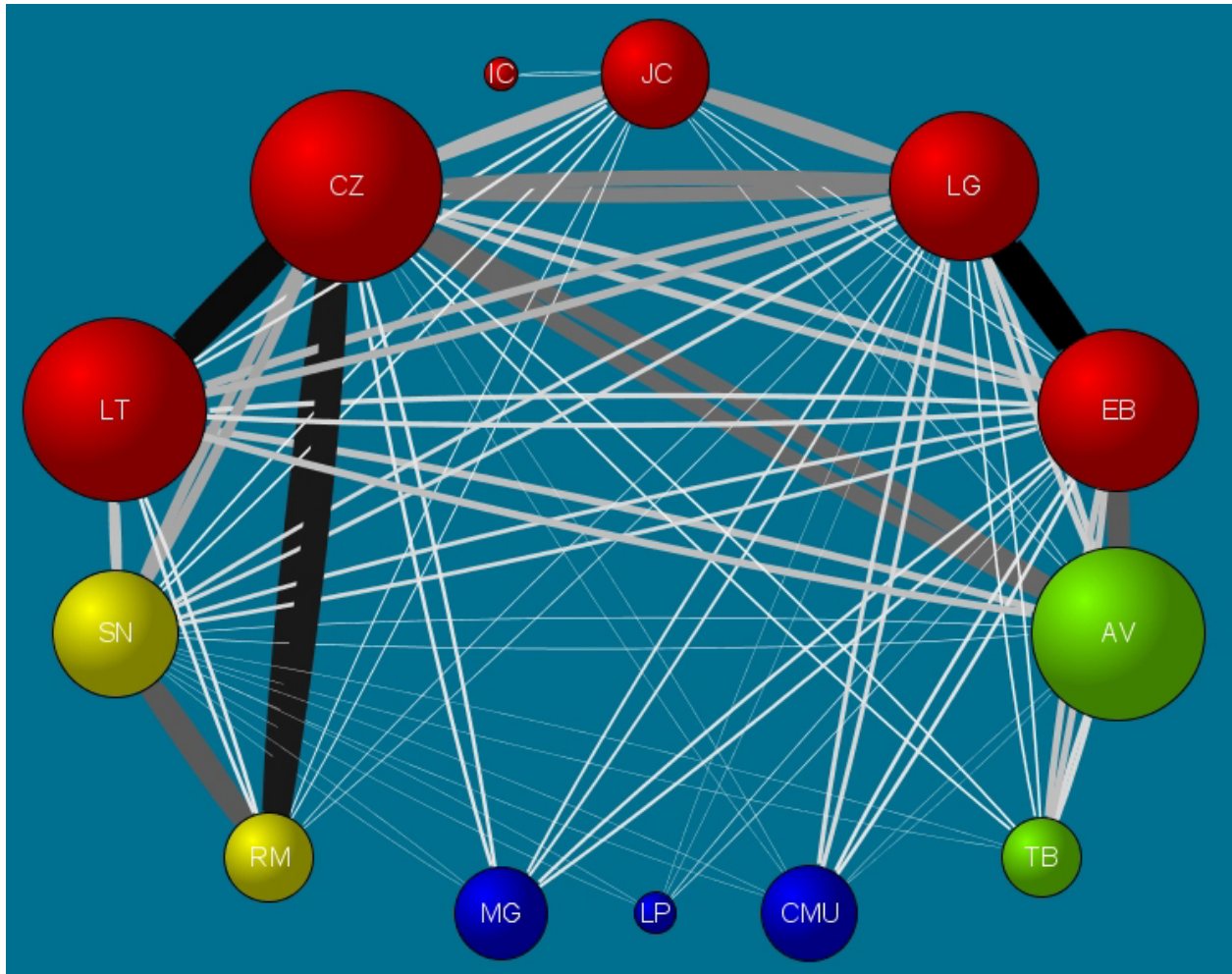


Figure 2. Merged Network. Node size = Number of actors. Color of node according to location relative to the Loreto National Marine Park: Immediately adjacent in red; to the North of the park in yellow; to the south of the park in green; other municipalities in blue. Relative connectedness among locations in shades of grey: white (few ties), black (many ties). Acronyms: Agua Verde (AV); Colonia Zaragaza (CZ); Ensenada Blanca (EB); Isla del Carmén (IC); Juncalito (JC); Ligüi (LG); Loreto (LT); Ramadita (RM); San Nicolás (SN); Tembabiche (TB); Mulegé (MG); La Paz (LP); and Comondú (CMU).

Occupation

Occupation has a less clear pattern although overall it practically has an inverse pattern to that of Locality. The QAP correlation tests show that occupation is not significantly correlated in most cases for the Local and Foreign Fisheries, and the Fisheries Institutional Support Network. In other words, within most communities, occupation is not an important structuring factor in how resource users share information for accessing fishery resources. For instance, in the Local Fisheries Network, Colonia Zaragoza is the only one significantly structured by occupation. That is, within this community resource users tend to share information mostly among those of the same occupation. This is a surprising outcome since it is in this locality where the highest diversity of occupations is found. In the Foreign fisheries, no community is significantly structured by occupation, and in the Fisheries Institutional Support network, occupation as structuring factor is important only in Agua Verde, Colonia Zaragoza, and Ligüi. That is, within these communities fisheries institutional support happens mostly within occupations rather than between them. Again, this is most surprising in Colonia Zaragoza, which has the greatest diversity of occupations (see Table 1).

Among the seven coastal communities, a randomization test of autocorrelation using locality as categorical variable shows that most occupations are permeable except for two occupations in the Local Fisheries Network, Diver/commercial Fisher and Commercial/sport Fisher. Members in these two occupations tend to share information mostly within their occupational categories.

In the Fisheries Institutional Support and Foreign Fisheries networks sharing of information happens across occupational categories.

At the municipal and state levels QAP correlation tests show that only the Foreign Fisheries Network at the state level is not structured by occupation. That is, when information for accessing fisheries resources is sought at the municipal and state level, most of the sharing occurs within occupations. A graphical representation of a merged network that combines all three types of networks (i.e. local, foreign, and fisheries institutional support) shows the emergent structure in terms of the relative connectedness among occupations (Figure 2). Overall, most of the exchange of information occurs between the Commercial Fishers and Diver/commercial Fishers categories. However, the Commercial/sport Fisher and Fish buyer/permit Holder occupations capture also an important part of the network activity, although again in connection with the Commercial fisher occupation.

Overall, social categories of locality and occupation appear as structuring factors under different types of networks and scales of aggregation. However, in both cases there are ties that connect both types of social categories, particularly in the case of occupations. This suggests that social categories are an ambiguous structuring indicator that may not always reflect the ways in which social action is structured. This gives support to the contention by relational sociologists that argued that social action is organized through and not motivated by categorical

affiliations (e.g., race or social class), but by the structure of tangible social relations in which persons are embedded (Emirbayer 1997).

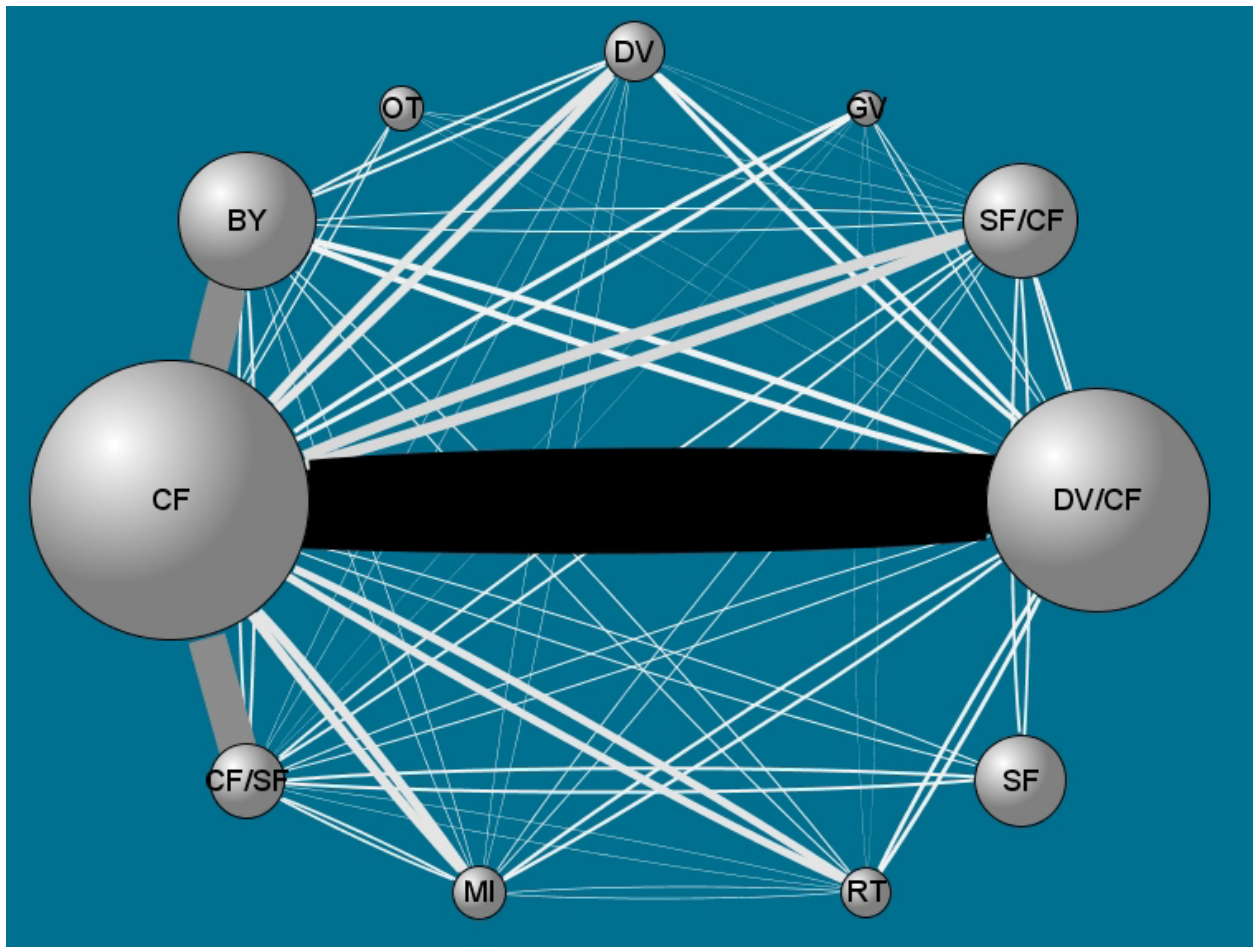


Figure 3: Merged Network. Node size = Number of actors. Relative connectedness among occupations in shades of grey: white (few ties), black (many ties). Acronyms: Commercial Fisher (CF); Commercial/Sport Fisher (CF/SF); Permit Holder/Fish Buyer (BY); Diver (DV); Government Employee (GV); Sport/Commercial Fisher (SF/CF); Diver/Commercial Fisher (DV/CF); Sport Fisher (SF); Resource Manager (MI); Retired (RT); Other (OT).

Social Embedding

The main question addressed regarding social embedding is: through what kind of social relations do resource users share information? I identified four types of relations: kinship, friendship, acquaintance and impersonal relations. I reduced three types of kinship relations to one type to make the analysis more tractable; i.e. I aggregated consanguine, affine and fictive relations (Truex 1981) into kinship social relations.

Regarding the degree of social embedding of the cooperative behaviour, QAP correlation tests showed that in most cases the four types of relations are significantly correlated with the different types of networks at the different organizational levels. Thus, I use the Quadratic Assignment Pearson correlation coefficients, which range from 0 to 1, as indicative of the degree of importance of the different types of relations in the social embedding process. Such correlation coefficients are comparable only within types of networks and not between them. However, the relative tendencies within types of networks can be compared among networks (i.e. Local and Foreign Fisheries, and Fisheries Institutional Support Networks).

Table 2 shows the Pearson's correlations coefficients for the three types of networks at the intra-community, municipal, and state levels. In the Local Fisheries Network a gradation of importance can be observed at the Inter-community and Municipal levels of organization: friendship > kinship > acquaintance. Friendship and kinship follow each other closely in importance but

not so for the acquaintance relations. In other words, friendship and kinship relations are the most important in the context of accessing fishery among the localities of the Loreto municipality. At the community and municipal level the Foreign Fisheries Network also shows gradation of importance, except that, perhaps as most would have expected, the relative importance among social relations changes: kinship > friendship > acquaintance. Yet, in these two levels acquaintance relations appear to cover more relative importance within the community and municipal organizational levels. It is at the state organizational level that acquaintance relations become more relevant than friendship.

In the Fisheries Institutional Support Network the pattern of the Foreign Fisheries Network more or less replicates at the intra-community level but becomes more complex at the municipal and state levels, in part, because it is at these levels where impersonal relations emerge. It is also in this type of network that acquaintance relations illustrate its greatest relative importance even at the intra-community organizational level. Although closely followed by kinship and friendship relations at the municipal and state levels, acquaintance relations take the lead in these two levels. The overall pattern of the relative importance of the four types of social relations in the Fisheries Institutional Support Network at the municipal and state levels is the same: Acquaintance > Kinship > Friendship > Impersonal.

Table 7.14: Pearson’s correlation coefficients of each type of social relation for each of the three types of social relations at different organizational levels

ORGANIZATIONAL LEVEL	TYPE OF RELATION	LOCAL FISHERIES	FOREIGN FISHERIES	FISH. INST. SUPPORT
Intra-Community	Kinship	0.657	0.759	0.743
	Friendship	0.682	0.524	0.495
	Acquaintance	0.288	0.370	0.443
Municipal	Kinship	0.651	0.750	0.566
	Friendship	0.690	0.518	0.420
	Acquaintance	0.294	0.395	0.591
	Impersonal	-	-	0.378
State	Kinship	-	0.663	0.569
	Friendship	-	0.491	0.416
	Acquaintance	-	0.551	0.594
	Impersonal	-	-	0.373

By partitioning the types of social relations used by type of network (Local Fisheries, Foreign Fisheries, and Fisheries Institutional Support) and organizational level (i.e. inter-community, intra-community, municipal and state) we have observed important patterns reflecting qualitative differences and effects of scale. Salient is the relative importance that acquaintance relations have depending on the type of network and organizational level beyond the patterns discussed at the intra-community level. Roughly, acquaintance relations increase importance from Local Fisheries through the Foreign Fisheries to the Fisheries Institutional

Support. Likewise, acquaintance relations increase importance from small (community level) through medium (municipal) to large (state) scales. Clearly, *strong* (kinship and friendship) relations are important in accessing fisheries resources but *weak* acquaintance relations may also play an important role in the *modus vivendi* of resource users and integration of large scale social systems (Granovetter 1983). Why do people cooperate through different types of social relations even under conditions of scarcity of fishery resources?

Explaining Cooperation

The best articulated view in the commons literature is that cooperation for solving collective action problems (access and use) required designing institutions to bring private costs in line with social costs. Otherwise, “Individuals may face incentives to continue extracting additional units [of the resource] beyond the optimal point since the costs of such excess takings are spread across the group, but the benefits go directly to the individual user” (Singleton 1998, 2). At the core of this general view is the problematic rational individual who now cooperates because institutions make it rational to do so and now defects because the institutional incentives are absent – the commons/tragedy of open access distinction. This indeed has been the approach of large-scale programs for community-based conservation (Bromley 1999), where results have been mixed, but experience has shown that political, cultural, and economic factors intertwined (Ghimire and Pimbert 1997, Guénette et al. 2000, Logan and Moseley 2002, Wells et al. 1992). Clearly, in the

commons/tragedy of open access distinction, there is a neglect of human emotions and social relations in human social cooperation.

The empirical evidence on the types of social relations that mediate the cooperative behaviour for accessing fishery resources among the seven rural communities adjacent to the LMP and other localities suggests other mechanisms may be important in determining people's cooperative behaviour. I advance the hypothesis that emotional bonds make a good candidate for such mechanisms in light of current evidence from the biological, psychological, and social cognitive sciences.

The Emotional Underpinnings of Human Cooperation

Most accepted views on human cooperation rely implicitly on the assumption that emotion and rational thinking are mutually exclusive or, at least, emotions are seen as irrelevant in human cognition (Franks and Smith 1999). This assumption has proved to be untenable and a barrier to understanding human cognition as it occurs in real-life social situations (Schwarz 1998). Moreover, the evolution of the human brain and its functioning suggest that a key feature in human evolution was its capacity for processing, interpreting, and signalling a variety of emotions necessary to create strong bonding relations (Turner 1999). The strong neural network connections that exist between subcortical and cortical frontal areas of the brain have been shown to enable and facilitate thinking, decision making, and planning (Damassio 1995). Indeed, assigning utilities to possible outcomes is possible because we can to a great extent subconsciously attach emotional valences

to past experiences (Turner 1999). Moreover, using neuro-imaging techniques on people playing prisoner's dilemma games, Rilling et al. (2002) have shown that we feel good when behaving cooperatively toward strangers.

Indeed, Sally (2000) argues that genuine human cooperation in social dilemmas is based on the emotion of sympathy. Frank (2001) argues that cooperation motivated by threat of punishment or ordinary material incentives as explained in repeated prisoner's dilemma games is more aptly called prudence than cooperation. Defection can also be explained on emotional grounds. For instance, people assign an initial valence (positive or negative) in response to practically every category of stimulus including persons (Frank 2001, Franks and Smith 1999). Likeness, then, may play a key role in how we make judgments about other people and the likelihood that we may engage in transactions with people that we hardly know (e.g. as in the case of impersonal relations in the sharing of information). It is possible then that people choose to defect because of the lack of an emotional bond, as in the case with perfect strangers, or because a person is associated with a negative emotional valence. We should also recognize that interests, beliefs, intentions, doubts, and other mental processes influence human action as well, and thus have a bearing on social facts (Bunge 1998). For example, in testing the hypothesis that repeated exposure to a behavioural model that assumes pure interests in the narrow sense tends to inhibit co-operation, Frank et al. (1993) found that training in mainstream micro-economics makes people more likely to defect

than non-economists in experimental prisoner's dilemma games: self-fulfilling prophecies are for real.

The evidence provided by diverse disciplines supports the idea that emotions and reason are mutually complementary rather than exclusive, particularly when it comes to social facts such as human cooperation where positive emotions may be an essential element, if only because emotions may provide a biasing effect in decision-making and planning (Damasio 1995). In sum, it is not far-fetched to hypothesize that the observed patterns of cooperative behaviour embedded in different types of social relations are sustained by long-term emotional bonds that commit individuals to cooperate even under adverse conditions for cooperation such as depleted fishery stocks.

Another important aspect of looking at emotionally-based social relations is that they expand beyond social categories and organizational units. This is important for improving the management of the commons that continue to face issues of scale and resource users' heterogeneity. If social relations are a key factor in how human actors have a propensity to cooperate, individual attributes such as stakeholders and interest groups may be less relevant to solve conservation and resource use dilemmas. Moreover, under certain conditions acquaintance relations may be a critical type of relation for integrating large-scale social systems.

Further evidence may be necessary to support the emotional mechanism hypothesis. However, if emotional bonds are indeed a key force in human cooperation, we should seriously reconsider our theoretical stands and analysis

regarding human cooperation and, in particular, how we go about promoting cooperative solutions for conserving CPRs through sustainable resource use, as in the case of the LNMP.

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