Accounting for the Impacts of Fishers' Knowledge and Norms on Economic Efficiency

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Abstract

Developing the theoretical links between the knowledge of fishers and societal economic outcomes is important if fishers' knowledge it to be taken seriously by policy makers. Having a theoretical basis that accounts for fishers' knowledge allows for rigorous approaches to marine ecosystem-based policy development that incorporates both social and ecological variables in management experiments. Social interactions that facilitate the development and communication of fishers' knowledge can improve aggregate economic performance by increasing productivity, reducing the risk of 'free-riders' engaging in opportunistic behavior, and encouraging the development of norms that support mutually beneficial collective action. The combination of (1) the social structures and protocols that facilitate predictable cooperative behavior and (2) the values that individuals hold which predispose them to cooperate with each other, are known as social capital. Social capital theory is useful for addressing pragmatic questions about how to target and strengthen social structural variables that most increase the likelihood of successful collective action. When considered as a variable affecting fishery sustainability, focusing on social capital can also be used for comparative policy assessments and help address questions of how to devolve governance to achieve efficiency-maximizing comanagement systems.

Keywords: Social Capital; Collective Action; Comanagement; Local Ecological Knowledge

Introduction

The use of fishers' knowledge has been hypothesized to facilitate effective fisheries management by utilizing context-specific information not readily available to external fisheries managers (*e.g.,* Johannes et al., 2000) and increasing the legitimacy of, and compliance with, fishery management rules (*e.g.,* Costanza et al., 1998). The need to incorporate fishers' knowledge seems to be especially important in tropical reef fisheries where our knowledge of ecological systems is relatively rudimentary (Jennings and Kaiser, 1998; Johannes, 1998) and where management organizations are perennially short of resources and expertise (*e.g.,* Chakallal et al., 1998; World Bank, 2000).

To be taken seriously in fisheries policy decisions, there needs to be a solid theoretical construct that explicitly links the use of fishers' knowledge with the social and ecological benefits that arise as a result. In particular, it is important to link the use of fishers' knowledge and economic performance because of the emphasis of economic performance in public policy decisions. A theory relating fishers' knowledge to economic outcomes would allow the development of testable research hypotheses and further the possibility for taking an experimental approach to fisheries policy development. Thus, an economic theory incorporating fishers' knowledge would facilitate the use of adaptive management approaches so important for marine ecosystem-based management (Walters, 1997).

Social capital theory has been developed and refined by social scientists in a variety of disciplines to account for the effects of social context on economic performance (Putnam, 1993; Woolcock, 1998; Ostrom, 1999; Rudd, 2000; Woolcock and Narayan, 2000). Increasing levels of social interaction tends to lead to: (1) increased knowledge about the world (which can reduce the costs of transforming ecological services into commodities for which humans hold economic value – food, recreational amenities, ecosystem resilience, etc.); and (2) increased knowledge about other people (which can increase trust or identify untrustworthy 'trading partners'), thus helping constrain individual opportunism. A variety of recent research has demonstrated the empirical effects of social networks and interaction on economic outcomes (Knack and Keefer, 1997; Narayan and Pritchart, 1999; Burt, 2000; Uphoff and Wijayaratna, 2000; Krishna, 2001). Social capital theory offers a potential link between fishers' individual and collective knowledge and experience, and economic performance via social structure.

Knowledge about the world and the behavior of others affects economic outcomes by different paths, but both ultimately depend on fishers' knowledge. The importance of fishers' local ecological knowledge (LEK) has been increasingly widely recognized by fisheries scientists and managers (Johannes et al., 2000; Neis et al., this volume) for fisheries planning and management. While there is recognition that the active engagement of local fishers can increase the legitimacy of management rules, and hence compliance (*e.g.*, Costanza et al., 1998; Russ and Alcala, 1999; Mascia, 2000), the importance of the role of fishers' knowledge of the behavior of others is probably not fully recognized by most fisheries

ecologists or managers. Knowledge about the behavior of others increases the likelihood of successful collective action needed to solve social dilemmas such as the 'Tragedy of the Commons' (Ostrom, 1999; Rudd, 2000), potentially reducing the transaction costs of fishery management and making community-based and comanagement governance systems economically more efficient than 'top-down' State management.

The purpose of this paper is twofold. First, it provides an overview of social capital theory, emphasizing how social capital links fishers' knowledge to economic and ecological outcomes. Second, it briefly examines how social capital theory can be applied to tropical inshore fishery policy analyses and research. My main point is that social capital provides a theoretical foundation for accounting for the impacts of fishers' knowledge and norms on economic efficiency. As such, fishers' knowledge, and the social structures and institutions that facilitate building and communicating that knowledge, should become a much more important focus of policy research.

Social Capital – Background and Foundations

Social Dilemmas and Collective Action

Social dilemmas occur when it is in the short-term self-interest of individuals to behave in ways that result in sub-optimal benefits at the aggregate social level. There are incentives for individuals within society, for example, to 'free-ride' by consuming public goods and maximize short-term self-interest at the expense of longer-term social interests. This problem often arises in fisheries. While it would be in society's best interest to maintain environmental quality – a public good – that provides a long-term flow of valuable ecosystem services such as reef fish production, collective action is needed to counter short-run incentives for individuals to overfish or engage in destructive fishing practices. Where collective action cannot be achieved, the results are often the devastation of the fishery and, in the worst cases, the destruction of the environmental base that could sustain future fishery productivity (*e.g.*, McClanahan et al., 1997; World Bank, 2000).

Public goods have two important characteristics: (1) society does not produce enough public goods because it is not in any individual's short-term best interest to do so; and (2) society as a whole would be better off if more of the public good were produced. Solving social dilemmas and conserving important ecosystem goods and services requires that individuals comply with formal or informal behavioral rules, incurring some short-run individual costs for long-run societal gain. Compliance with these rules by individuals can be viewed in terms of internal cost-benefit calculations that are influenced by the physical environment, market prices for products, formal rules and enforcement mechanisms, and social norms (Crawford and Ostrom, 1995; Ostrom, 1999). Institutions – systems of formal management rules and informal social norms (North, 1990; Ostrom, 1990) within which resource users function – influence incentives and, thus, compliance with fishery management policies.

The idea that social context matters for socio-economic performance is not new (see Portes, 1998), but there has been a recent surge of research in the field, much of it with very important policy implications. Much of the interest, and controversy, can be traced back to a study of regional economic development in Italy by Putnam (1993). Putnam claimed that there were positive economic externalities – spillover effects – from mundane social interactions such as participation in choirs. Putnam argued that choir members tended to have increased levels of 'general trust' (*i.e.*, trust for people who are not personally known) as a result of their social interactions within their choirs. Having trust for strangers can make it easier to engage in transactions with them and, in aggregate, can even enhance the economic performance of regions or countries, so the argument goes.

While the nature of causality linking social interactions, trust and economic performance have been a source of debate (see Woolcock, 1998; Rudd, 2000), there is widespread recognition within the social sciences that social networks and institutions have an important impact on economic performance (North, 1990; Nee, 1998; Ostrom, 1999; Burt, 2000; Woolcock and Narayan, 2000). Engaging in social transactions and trade is ultimately a matter of trust because agreements can never be made that cover all possible contingencies. There is always some risk that a trading partner will cheat on an agreement and engage in short-term opportunistic behavior. Institutions based on trust and reputation can help constrain

opportunism, solve social dilemmas and, hence, increase the economic efficiency of producing public goods.

Social Capital – A Fisheries Example

Tropical reef fish stocks are a type of public good known as a common pool resource. They are subtractable – capture of fish means that there are less available for capture or consumption by others – and non-excludable – it is very difficult to prevent a person from using the resource (see Ostrom, 1990). Tropical inshore fisheries are particularly complicated to manage because of the multiple species, myriad fishing technologies, and the difficulties inherent in monitoring and enforcing regulations (*e.g.*, Dalzell et al., 1996; Chakallal et al., 1998; Johannes, 1998). Maintaining environmental quality and the productivity of reefs that supply humans with a variety of ecosystem goods and services is a public good transaction and is, therefore, vulnerable to free-riding and individual opportunism. In tropical developing countries, where formal institutions may be relatively weak, social networks remain important for controlling opportunism and solving social dilemmas in the inshore fisheries (*e.g.*, Sutherland, 1986; King, 1997; Cooke et al., 2000; Mascia, 2000; World Bank, 2000).

Consider the well-known case of Apo Island, Philippines (Russ and Alcala, 1999), where a small community was able to implement a successful marine protected area (MPA). A community-based management initiative was developed in 1982 with technical support from Silliman University and, by 1985, the Apo community endorsed an MPA for the entire reef. A Marine Management Committee, comprised of local community members, developed a management plan and met regularly. Between 1989 and 1990, a community education center was built with assistance from Silliman University and an Earthwatch expedition. Russ and Alcala (1999) note that "the planning, construction and frequent use of this building have been critical factors in maintaining the enthusiasm of the residents for the [MPA] concept. It has provided the community with a useful venue for meetings…" (p. 312). The MPA has enjoyed long-term, strong local support and compliance, and has met virtually all of the original objectives set forth by the community members.

Biologically, the result was an increase in fish density and biomass within the MPA and, according to local fishers, improved fishing adjacent to the MPA. There have also been tourism benefits for the local community, as Apo has developed into a popular dive destination. One can argue that the Apo community solved a social dilemma by establishing their MPA. The ecological services the MPA provided has resulted in a long-term stream of economic benefits to local residents that they would not have otherwise enjoyed. Without social capital – the rules and social norms that prevented opportunism on Apo – it is virtually certain that all economic rents would have been dissipated under open access conditions.

At nearby Sumilon Island, Russ and Alcala (1999) document the experience of developing and managing another MPA. The Sumilon MPA, which was established in 1974, experienced alternating phases of compliance and management breakdown over 25 years. The densities of large predatory reef fish decreased during the management breakdowns and any long-term benefits of the MPA have been virtually eliminated. The breakdowns in management – caused in part by a lack of trust between the community and outsiders (Silliman University and the Philippine national government), and in part by local politicians engaging in opportunism – led to depletion of fish stocks and the dissipation of resource rents that might have been collected through ongoing cooperation. Unlike Apo Island, the Sumilon MPA never gained genuine community-level involvement and support. Local rules and social norms were unable to prevent free-riding (in the form of destructive overfishing) and long-run economic performance has suffered as a result.

Social Capital Theory – Linking Fishers' Knowledge to Economic Performance

A number of disciplinary perspectives on social capital have emerged within the social sciences. Sociologists tend to hold a narrow view of social capital and concentrate on how one can use social networks for personal economic advantage by drawing on resources within the network (Nee, 1998; Burt, 2000). The emphasis is on narrow trust, prudence based on personal experience or on the basis of another person's reputation within a social network. Political scientists tend to emphasize civil society and how it

can enhance the level of general trust in a society. Having trust for strangers can make it easier to engage in transactions with them and, in aggregate, can enhance regional economic performance (*e.g.*, Putnam, 1993). Economists tend to think of social capital in even broader terms, as the institutional infrastructure that facilitates trade with strangers whom one might not trust at all. Property rights, money and banking, insurance, and the legal system reduce our reliance on personal trust, thus reducing the transaction costs of trading (Williamson, 1985; North, 1990).

Investments in social capital entail an opportunity cost but permit people to become more productive in fulfilling human aspirations. As Uphoff and Wijayaratna (2000) emphasize, social capital is associated with *mutually beneficial collective action*. Social and kin networks (*e.g.*, organized crime, gangs) can be close knit, but the overall societal results of their actions can be negative because these social networks benefit one group at the expense of society as a whole. Such networks should not be considered social capital. For example, at the beginning of lobster fishing season in the Turks and Caicos Islands (TCI) a local phenomena known as the 'Big Grab' occurs (Béné and Tewfik, 2001; Rudd et al., 2001). Many people take leave from their regular employment in other regions and come to South Caicos, the center of the local fishing industry, to go lobster fishing. These fishers, who are usually not skilled divers, target undersize lobster in shallow areas. As many as 95% of lobsters landed in some fishing grounds are under legal size limits. Constraint on the part of visiting fishers would allow more lobster to reach larger sizes, benefiting the resident fishers and TCI society as a whole. Tight kin networks, in this case, actually facilitate the plunder of the lobster resource because relatives are given access to accommodations, supplies and access to boats that are needed for fishing. Clearly, the social relationships used in this situation lead to personal gain (fishers during can earn hundreds to thousands of dollars per day during the Big Grab) but do not lead to mutually beneficial collective action and should not, therefore, be considered social capital.

Uphoff and Wijayaratna (2000) define two types of social capital. Structural social capital consists of the rules, procedures, and protocols that make it easier for people to work together to achieve mutually beneficial collective action. Cognitive social capital consists of the norms and values that people

hold, which predispose them to cooperate with each other and work for mutually beneficial collective action. Veitayaki (1998: 52) provides an illustration of how structural and cognitive social capital coexist in traditional Fijian fishery management:

> "Traditional management arrangements are enforced through traditional authority, which means that there are protocols to be followed. The social structure and close-knit units in Fijian communities demand that people strictly follow tradition and respect each other. Decisions made by the group are often conveyed through the social channels of communication, which ensures that all those involved are made aware of the group's decisions. Consequently, the traditional system of retribution is an effective way of ensuring compliance. Nonconformists are treated harshly, and this is an effective deterrent to others…"

How does social capital work? First consider reef fish as an economic commodity such that output $V = v(L, K)$, where L is labor input and K is capital input (*e.g.*, boat and motor). Increasing L and K will, initially, lead to an increase in output. As inputs increase further, reef fish landings typically exhibit decreasing returns and, eventually, increasing use of L and/or K can lead to declining returns and total dissipation of economic rent under open access. If social interactions can constrain opportunism and help society avoid the open access equilibrium, then investments that encourage social interaction will increase societal economic returns.

At Apo Island, for instance, there was a relatively small financial investment in a Community Education Center. The process of developing a management plan and vision for the Apo community and general exchanges of fishers' knowledge (which undoubtedly led to positive non-fishery spin-off benefits) were facilitated by the financial investment in the Center. If fishery output is now viewed as $V = v(SI, L, K)$, where the additional input (SI) is the social interaction needed to maintain community enthusiasm and compliance, then the value of the social interaction is the net return once the costs of the other inputs (*i.e.*, Center construction) are met. The long-run returns to the fishing community would not have been possible without the durable effects of social interaction and the overall returns have certainly exceeded the modest financial investment in the Center.

Flows of information, whether formal or informal, have three possible effects. First, increased knowledge of the behavior of others reduces the risk of free riders, hence reducing costs imposed by

cheaters depleting the resource (*e.g.*, 'known thieves' in the Belizean lobster fishery are closely monitored and socially marginalized – King, 1997). Second, increased knowledge about the non-behavioral environment improves productivity and reduces both risks and transaction costs (*e.g.*, productivity increases as a result of some fishers engaging in innovative behavior and others learning by example). Finally, collective action and coordination increase overall social benefits by helping to maintain compliance with social norms or formal rules.

Rudd (2000) summarizes by noting that informal or formal social interactions help solve social dilemmas by reducing transaction costs and increasing knowledge about both the world and the trustworthiness of other individuals. Economic performance can be enhanced by quantity-increasing measures (increased knowledge about the world and the transformation processes involved in production), cost-reducing measures (a reduction in production and transaction costs) and/or revenue enhancing measures (via gains from trade or increased knowledge about other trading partners). Social capital is a function of social interactions and social structural variables that may, on the surface, serve no explicit instrumental economic function.

When fishers imitate the innovations of another fisher or pool information about fishing conditions on the local dock at the end of the day, they are engaging in a type of social interaction that increases knowledge about the world and that has durable effects. Fishers that gain knowledge about the behavior of others through personal experience or reputation are in a better position to assess trustworthiness. If fishers trust other fishers, they may be able to exchange favors that help reduce fishing costs. On a broader scale, if there is trust between fishers and government, there may be more informal cooperation in developing fishing regulations and less need for costly enforcement or litigation.

Functions of social capital

Social capital can function on two levels, as an asset that can be used for either 'bonding' or for 'bridging' (Woolcock and Narayan, 2000). Bonding occurs when strong intracommunity ties give kin and communities a sense of identity and common purpose. Bonding social capital is especially important for

the rural poor because it serves as a substitute for the State when citizens are deprived of basic services. Bridging occurs when communities endowed with diverse intercommunity ties are in a stronger position to confront problems and take advantage of economic opportunities.

For example, the Fijian government plays a relatively limited role in the management of inshore reef fisheries in many parts of Fiji due to their limited resources and inter-governmental jurisdictional conflicts (Cooke et al., 2000). Many communities in Fiji are left more or less on their own; even though they possess high levels of social capital (*e.g.*, Veitayaki, 1998; World Bank, 2000), this asset is used for bonding purposes, helping communities to cope and manage local Customary Fishing Rights Areas without strong government support. In Samoa, on the other hand, the government has worked closely with village councils to develop national legislation that supports local fisheries management (Zann, 1999) and provided the services of extension officers to assist village councils developing local management plans (King and Fa'asili, 1999). The rapid adoption of village management plans and the implementation of a surprisingly high number of village MPAs is indicative of bridging social capital. Ideas and knowledge have flowed rapidly between villages. All villages that are part of the network benefit, increasing their capacity for solving local social dilemmas by accessing fishers' knowledge from other regions regarding successful MPA design experiences and how to effectively monitor and enforce village rules.

Community and Institutional Capacity

Fishers' knowledge plays a key role in the development of community-level social capital and solving local social dilemmas. The transaction of interest in inshore tropical fisheries management is the maintenance of environmental quality, a public good. The economic goal is to capture long run benefits, the ecological goods and services that flow in perpetuity from a healthy reef ecosystem, for human well being. This is a transaction that normally has a high degree of specificity; that is, local knowledge is very important for understanding the unique aspects of the system. Broader cultural, institutional and ecological context all influence the degree to which LEK is transferable beyond the local level (Ostrom,

1990; Ostrom et al., 1993). While local social capital may serve a useful bonding function, it should be clear that achieving broader scale sustainability for reef fisheries also depends on the institutional capacity of national or regional governance organizations. Community-level social capital alone will not be enough to solve all social dilemmas; the institutional infrastructure that the 'New Institutional Economics' emphasizes (Williamson, 1985, 1994; North, 1990) also has a role to play.

If communities don't have legally entrenched management rights, for example, communities may not be able to exclude outsiders from fishing in their local grounds and depleting stocks (*e.g.,* World Bank, 2000). Evidence suggests that social capital can sometimes act as a substitute for government but that social dilemmas are most effectively solved when strong governance organizations are present in combination with vibrant, capable communities (Uphoff and Wijayaratna, 2000; Woolcock and Narayan, 2000; Krishna, 2001). Institutional capacity depends on factors like the strength of the legal system, property rights, the degree of government corruption, research and extension capacity, and the awareness of fisheries problems by bureaucrats and elected officials. There is certainly an ongoing need to account for fishers' knowledge in the education and government decision-makers.

Applying Social Capital Theory in Fisheries

Using social capital theory in a fisheries management context permits policy research that would be difficult or impossible using standard economic approaches. Three areas of particular importance are outlined below: (1) identification of key social structural variables in which investments can be made to build social capital; (2) comparative policy analyses that account for \various combinations of community and institutional capacity; and (3) analysis of efficiency-maximizing comanagement systems for maintaining environmental quality and long-run fishery production in inshore reef systems.

Social Structural Variables

Linking fishers' knowledge and economic outcomes using social capital theory makes it possible to hypothesize about the effects that specific social structural variables might have on the flow of fishers'

knowledge, the development of trust and cooperation, and the transaction costs of producing public goods. Substantial guidance on the effects of various structural variables affecting cooperation and collective action is available in the common property literature (see Ostrom 1990, 1998, 1999). Ostrom (1998) outlined a theory of behavioral rational choice where a self-reinforcing 'core relationship' between trust, reputation and norms of reciprocity lead to increased levels of cooperation and, hence, net benefits. For any particular situation there might be a mix of salient structural variables, some of which could be used to build social capital via their enduring structure (*e.g.*, the availability of meeting places for community members as in Apo Island) and some of which could build social capital via their enduring effect (*e.g.*, the availability of transparent information about the past actions of community members).

From a policy perspective, the State faces a number of choices for managing fisheries, each of which has costs. Top-down management by the State ('command-and-control') has generally proven ineffective for tropical artisanal fisheries management (Johannes, 1998). The question arises as to whether government might be best spending scarce resources on other non-traditional policy options rather than trying to enforce rules that are essentially unenforceable. Social capital theory suggests that fisheries management might be improved far more by targeted spending on specific social structural variables. For example, the construction of meeting halls, sponsoring visits of fishers to other communities, or the provision of facilitators and extension agents for community management planning are relatively modest investments may have substantial impact on long-run tropical inshore fisheries sustainability.

One insight of particular importance has emerged from social capital research. That is, that the process of working together on projects can be more important than achieving 'successful' results. O'Brien et al. (1998) found that the horizontal social linkages characteristic of successful communities led to benefits even if the specific project that volunteers worked on was a failure. The process of local people working together is more important than the accomplishment of any specific project of objective. An implication of this result is that the process of developing a community fisheries management vision can be seen as a key social structural variable affecting social capital. The vision-building process of identifying alternative policy options and deliberating about relative their merits build social capital,

helping to create shared understanding and generalized trust that has positive spin-off effects in other aspects of community life (Rudd, 2000).

Comparative Policy Analysis

It is now widely recognized that any single policy goal can be achieved using a variety of tools (*e.g.*, Ostrom et al., 1993). Transaction costs (*i.e.*, gathering information, reaching agreements regarding the harvest and allocation of resource flows, and monitoring and enforcing those agreements) will vary according to the level of social capital that a community or region possesses and according to ecological, cultural and institutional context. The costs of different policies that might achieve a given end can, in fact, vary greatly.

When community level and state level capacity are considered jointly, a number of situations might be encountered. In northern Belize, relatively high social capital exists in combination with relatively high institutional capacity (Sutherland, 1986; King, 1997; Mascia, 2000). Fishers have a history of collective action going back to the 1960 formation of the Northern fishery cooperative. Government is quite strong by Caribbean standards and is supportive of cooperatives. Local fishers, as a result, have been able to collect substantial economic rents from fishing over the past 40 years. Coastal Belize is not pristine, but compared with much of the Caribbean is ecologically intact despite export-oriented commercial fisheries.

Contrast this to the situation in the Turks and Caicos Islands, where a centralized government department manages fisheries using conventional tools (*e.g.*, total allowable catch, size limits, seasonal closures, etc.). Community capacity in the islands is low. There are strong kin ties, but 'The Big Grab' demonstrates that there is little mutually beneficial collective action (Béné and Tewfik, 2001; Rudd et al., 2001). In general, community apathy is high and effective enforcement of top-down rules is limited by limited government resources and low compliance.

In Fiji, some strong traditional fisheries management systems are still intact. The government, while generally supportive of the traditional management system, can be somewhat irrelevant for local

communities (Veitayaki, 1998; Cooke et al., 2000; World Bank, 2000). Local community management capacity is high, but there is limited input or support from government. Poaching is a major concern for local people except in areas where communities highly dependent on local marine resources have adopted strong (perhaps illegal) independent enforcement mechanisms.

Finally, consider situations where both community and institutional capacity are lacking. While there are remnants of traditional fisheries management systems in Kenya, population pressure, widespread adoption of destructive fishing practices, and cultural changes have eroded community capacity in many areas and have led to severe overfishing (McClanahan et al., 1997). The Kenyan government has limited resources and has encountered major challenges in dealing with fishers who don't trust them. Conflict, rent dissipation and ecological degradation are widespread as a result.

Why does social capital matter in comparative policy analysis? Consider the example of MPAs as a policy option for sustainable tropical reef fishery management. MPAs are widely advocated as an important policy tool for implementing adaptive marine ecosystem management at the community level (Costanza et al., 1998). The argument made by community-based MPA advocates usually revolves around three transaction costs: information costs are lower for MPAs compared to traditional management; the costs of monitoring fisher compliance are lower because it is simple to see, yes or no, whether someone is fishing inside MPA boundaries; and enforcement costs are lower when MPAs are locally implemented. Compliance is more likely when the community has a vested interest in the resource. In addition, cheaters can be punished immediately and internally rather than waiting for the more lengthy and costly process of court litigation.

When considered in light of social capital theory, it becomes clear that the conclusions above will only hold under a certain set of assumptions about community and institutional capacity. When there is a high level of local social capital and an institutional backstop that provides legally binding sanctions when necessary, the arguments in favour of MPAs are likely valid. So, perhaps MPAs would be a preferred policy tool in Belize, but what about the Turks and Caicos, where community capacity is weak, or Fiji, where institutional capacity is limited? Where there is community apathy, as in the Turks and

Caicos, an MPA is likely to revert to open access due to low compliance (*i.e*., social norms are not sufficiently strong to prevent widespread individual opportunism). When institutional capacity is low, as in Fiji, local leaders may feel powerless trying to use traditional sanctions on fishers from outside their own community. The only general policy conclusion that can be drawn is that there will be no simple blanket policy prescriptions from country to country, or even from fishing ground to fishing ground in some cases. Understanding social capital will be crucial for choosing policy instruments that can increase the likelihood ecological and economic sustainability. This requires that we understand and account for fishers' knowledge about the world and the behavior of other resource users.

Comanagement and the Proper Scope of Governance

Social capital also plays an important role when considering government decentralization (transfer of authority to local government agents) and the devolution of fisheries management authority to local communities. The key question is how management authority can be decentralized or devolved so that overall fisheries transaction costs are minimized. Answering this question is contingent on the level of social capital in the region.

Determining the proper scope of governance is a major new research focus in the New Institutional Economics (*e.g*., Williamson, 1999; Knight, 2001). A strong argument can be made that pure market approaches are unsuitable for tropical artisanal fisheries (they are subject to market failure because of the public good nature of the ecological base that supplies valuable ecological services). Thus the question becomes one of determining an efficient comanagement balance between the 'State' and the 'Community'.

The discriminating alignment hypothesis (Williamson, 1985) postulates that transactions have certain attributes and that governance systems have certain competencies. Minimizing societal transaction costs requires that these two factors be aligned. In tropical inshore fisheries, the transaction of interest is the maintenance of reef environmental quality and productive capacity. One attribute of this transaction is the high degree of uncertainty it entails, as our understanding of fishing impacts on complex reef

ecosystems is limited (Jennings and Kaiser, 1998; Johannes, 1998). Aligning governance systems when there is uncertainty in artisanal fisheries depends on the degree of predictability of fish in time and space. Management by the collective action sector is usually more appropriate when resource users work in a predictable local environment, have higher levels of social capital and exhibit a high degree of dependence on the resource. Decentralized State governance may be more appropriate, however, if local management input is required for the resource but the collective action sector is weak. If regional management is important (*e.g*., there is widespread downstream dispersal of larvae important for fisheries recruitment in other regions), then comanagement tipped in balance towards the State will be more suitable.

Conclusion

To be taken seriously in fisheries policy, there needs to be a solid theoretical construct that explicitly links the use of fishers' knowledge with the economic benefits arising from collective action. This can be accomplished using social capital theory.

From a policy perspective, there are also important pragmatic issues. If the use of local knowledge increases resource sustainability, how can policy interventions target key social structural variables that build and share local knowledge? In many cases in tropical developing countries, it is likely that the most economically efficient policies are those that build community and institutional capacity for extended periods before even dealing with fisheries management *per se*. The success of devolution depends on local participation and the ability of the collective action sector to overcome individual opportunism. The likelihood of success increases as fishers' knowledge is increasingly taken into account. Social capital is, therefore, an appropriate indicator of the extent to which State and Community can work together to manage fishery resources.

Caution must be exercised, however, to ensure that the concept of social capital is not applied simplistically in cursory policy analyses. While there are strong theoretical reasons why fishers' knowledge and community capacity will have an impact on economic outcomes, there are equally strong

reasons why social capital, on its own, cannot solve all tropical inshore fisheries management problems. Effective conservation and fisheries management policies must consider ecological and cultural realities to minimize fisheries management transaction costs. In some cases, when fish stocks are highly mobile or inherently unpredictable, or when local communities have low internal capacity to solve social dilemmas, there may still be an important role for State involvement in fisheries management. Even in these cases, however, accounting for fishers' knowledge will be important, as effective State management will also depend upon context-dependent knowledge until local capacity for comanagement is increased.

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