AN INTEGRATED ASSESSMENT OF INDONESIAN RIVER FISHERY RESERVES. PART 2. INSTITUTIONAL ANALYSES.

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ABSTRACT

This paper (Part 2 of a 4-part set) describes the institutional analyses carried out at eight sites under the 'River Fisheries Reserves' project (see Part 1 companion paper for introduction). While the biological and socio-economic studies focused on the *outcomes* of reserve management (see Parts 3 and 4), the institutional research focused on the *process* of management, in particular how management regulations were designed and supplied, and how this affected local stakeholders' willingness to comply. In S. Sumatra, reserves were managed by government and fully closed against all forms of fishing, though enforcement was sometimes poor. In W. Kalimantan, reserves were designed and managed by communities, and some forms of fishing were allowed inside the reserve, either by the least effective gears, or outside the dry season. In Jambi, the village 'reserve' in Arang Arang proved to have few effective conservation rules, while the Danau Lamo reserve, newly established by government and community members was fully closed. The government reserves in S. Sumatra were least well supported by local communities. The institutional design features that may have contributed to the three most 'successful' reserves (where rules had been designed, put in place and complied with) are discussed. Such features should be incorporated where possible in any attempts to implement new river reserves or other river fishery co-management schemes.

Keywords: protected areas, co-management, floodplain river fisheries, fishing regulations, enforcement

INTRODUCTION

This paper describes the institutional research undertaken as part of an integrated, interdisciplinary study of river fishery reserves in Indonesia (see Part 1 companion paper for introduction). The institutional studies focused on the *process* of management, in particular how management regulations were designed and supplied, and how this affected local stakeholders' willingness to comply. In this context, the term 'institution' is defined as "the set of working rules that is used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions" (Ostrom, 1991). 'Institutions' as used in this paper are thus not the same as organisations or agencies.

Results from the institutional research (both from the initial 'regional reserve survey', and the follow up work) provided insights and possible explanations to the biological and socio-

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economic outcomes of reserve management (see Parts 3 and 4 for details of these other studies). Such results are discussed, where relevant, in the subsequent parts of this paper. An overview of the key institutional results is given in this paper, with particular regard to their influence on the effectiveness of management arrangements at each study site.

MATERIALS AND METHODS

Institutional analyses (IA) were conducted in each study village, both as a component of the initial RRS fieldwork (see Part 1 companion paper), and as specific IA fieldwork in August and October 1999. The background theory, methods and results for the latter are described briefly here and can be found in more detail in Garaway and Samuel (1999).

In the initial exploratory research (RRS), the institutional studies focused on understanding the key fishery management characteristics of each study site. Information collected included the following:

- current and historical fisheries rules and regulations (e.g. about species, seasons, gears, access, places, allocation of fishing spots) and their rationale;
- decision-making institutions and relationships between different decision-making bodies, both formal and informal;
- the level and effectiveness of rule monitoring and enforcement; and
- the presence of conflict and conflict-resolution mechanisms.

Information was cross-checked by firstly collecting the same information from different sources and/or by different methods and secondly by actively seeking out and addressing any contradicting or interesting information that emerged during an interview. All team members were informed of any contradictions and, where possible, these issues were integrated into subsequent interviews at the site. Finally, the observations on the collected data were presented to a stakeholder meeting in each province to seek local views and interpretations.

In the 1999 IA fieldwork, the understanding gained in the initial RRS work was extended by further structured interviews at each of the field sites. Research focused on gaining an understanding of:

- the extent to which rules designed (by government and / or local decision-makers) to govern resource use were (a) put in place and (b) complied with; and
- how the institutional characteristics of the situation (as well as any characteristics of the communities and the resources themselves) may have affected the capacity and willingness of local decision-makers and communities to develop new institutions for fisheries management, and to comply with them.

In these 1999 IA studies, the data from South Sumatra and Jambi were analysed against a set of well-known ‘design principles’ suggested as necessary conditions for *enduring* local user involvement in common pool resource management (see Table 1, based on Ostrom, 1991). For the sites that were found to have good conditions for community involvement in management, further consideration was given as to whether or not the site characteristics encouraged the process of institutional supply (i.e. the design of new management rules). For this, the interview data were further analysed against a second set of ‘enabling design principles’ (see Table 2).

RESULTS

Reserve management rules and authorities

At the province level, rules for reserve management were generally set up and maintained by local village communities in W. Kalimantan, and by the government Fisheries Service (Dinas Perikanan) in S. Sumatra (see Table 2 in Part 1). In Jambi province, examples were found of both community based management and management that was more shared between the government and local communities.

In the reserves designed and managed by the communities (all of the W. Kalimantan study villages and Jambi's Arang Arang), management rules restrained the use of certain gears or seasons (or both), but some fishing was still allowed inside each reserve (Table 2 in Part 1). This contrasted with the government-designed reserves in S. Sumatra and Jambi's Danau Lamo village, where the reserves were fully closed to all forms of fishing all year.

Other village characteristics and fishing access arrangements

The study villages varied in size from only 6 households in Teluk Gelam (S. Sumatra) to over 5,000 households in Pedamaran (S. Sumatra) (Table 3, based on the initial RRS studies described in Part 1). Some of the villages were permanently settled, while others had only temporary inhabitants (mostly due to the auction systems of access allocation – see below). Some of the villages had homogenous communities (e.g. with a single culture or religion), while others had more mixed communities. The dependence on fishing also varied from relatively low levels in S. Sumatra to around 50% in Jambi and up to around 90% in the remote W. Kalimantan sites.

Arrangements for fishing access varied both between provinces and between the study sites within each province (Table 3). In both S. Sumatra and Jambi, fishing rights were auctioned each year. In Jambi, bidding at the auction was restricted to the village members, while in S. Sumatra, most auctions were open to any bidders. In the W. Kalimantan sites, fishing was freely accessible to village members using most small gear types. In Meliau and Sekolat, the best locations for barrier trap fishing were re-allocated every fortnight using a lottery system.

Objectives of fisheries management

In all sites there was evidence that fisheries regulations of some type had been designed, implemented and complied with. However, the provinces varied significantly with respect to management objectives and institutional structure. In Jambi and W. Kalimantan, regulations were issued by local village administrations in order to reduce conflicts, distribute benefits between village members, conserve fish resources, and/or to earn income for their own community development. In contrast, in South Sumatra, regulations were issued by the regional government, in order to reduce conflicts, conserve fish resources, and raise *government* revenue.

Status of harvest reserves

Whilst there was evidence that some types of regulations had been implemented and complied with in all sites, the situation with reserves was different. Only three sites out of the possible eight (Table 4) had successfully implemented reserve management regimes, i.e. where rules had been designed and put in place, and were largely being complied with.

For the other sites, two of the reserves (Arang Arang and Lebak Nilang) existed on paper, or in the minds of government officials more than they were recognized, understood or followed by local users of the resources. The final two reserves (Teluk Rasau and Tengkidap) had been implemented, but there were significant problems with compliance (see Garaway and

Samuel, 1999, and Part 3). In the non-reserve, Pulau Majang, the use of poison fishing by the remote tribesmen was in conflict with both government regulations and the wishes of the main community.

Incentives for local involvement in management

There were great differences between the Provinces in the extent to which the institutional design principles thought to facilitate management (Table 1) were satisfied. The design of fisheries management institutions was far more conducive to encouraging local involvement in Jambi than in South Sumatra. Critical constraints in South Sumatra included: the lack of clear boundaries (both of the resources themselves and of the eligibility of different people to use them); the lack of rule adaptation to local circumstances; the inability of users to participate in rule design; and the lack of recognised rights for them to do so. This lack of incentives is suggested as one reason why there were problems with compliance in Teluk Rasau, as shown in Part 3.

Incentives for local involvement in supplying new management

For the two Jambi sites that had the best conditions for local management, the IA looked at the extent to which the local communities had the enabling characteristics and incentives thought necessary to set up and adapt reserve management themselves. Of the characteristics that could be investigated in the time available, both Danau Lamo and Arang Arang displayed characteristics 1, 2, 3, 6, 8 and 9 of Table 2. Danau Lamo also had a particularly skilled village leader (enabling characteristic 4) who may have contributed to the effectiveness of management at that site (see Garaway and Samuel, 1999 for further details).

Another requirement for local involvement in management is that the benefits from supplying new management are tangible and relatively quickly realized. It was this characteristic that was believed to be crucial in separating the perceived success of reserve implementation in Dano Lamo from the lack of recognition in Arang Arang. In the former, benefits from the reserve, particularly cage culture and stocking, were very obvious to local users. In Arang Arang, no locals had seen benefits for themselves but only been told about them by government officials.

DISCUSSION

Features of institutional design that affected reserve management success

These studies have shown that the simple designation of a reserve by government will not, on its own, necessarily ensure its effective implementation. Positive community involvement in designing reserve management rules is believed to be an important factor in the effectiveness of implementation at the three ‘successful’ study sites (Table 4). Each of these sites displayed many of the design principles listed in Tables 1 and 2, e.g. small size, clear boundaries, good leaders etc. Such design principles are fully incorporated into the Management Guidelines, also produced by this study (Anon., 2000). The validity of these institutional design features is further supported by this study, in that where they existed, so did community involvement. Such principles and the ways they were satisfied should clearly be recognised in any attempts to implement new reserves or other river fishery management schemes.

In addition to the enabling design features recognised above, acceptance of the reserve rules may be improved by complementary measures that make the benefits of compliance more obvious to the users. This was achieved at the ‘successful’ Danau Lamo reserve, by a stocking programme, undertaken by the Department of Fisheries, to coincide with the establishment of the reserve. Such initiatives may be more *perceived* to increase the value

of the resource, through physical inputs to the system, and thus lead to improved respect for the new rules. Similar positive influences have also been documented in other research (e.g. Lorenzen and Garaway, 1998). However, such initiatives may not in themselves be sufficient to overcome other difficulties. Fish were also stocked in Teluk Rasau, for example, but access restriction rules were still poorly complied with. In this case, due to the lack of local participation in rule design and monitoring, the increase in the perceived value of the resource may simply have increased incentives to poach.

It is also important to note that incentives to comply with regulations are needed for government staff as well as communities. At Teluk Rasau the incentives of government staff to monitor and enforce effectively, were reduced both by their low salaries and by the substantial local disagreement with rules. Such conditions make an outsider's monitoring job extremely difficult.

Links between management processes and outcomes

This study found that the fishing communities of Meliau and Sekolat in W. Kalimantan and the government-community co-management arrangement in Danau Lamo (Jambi) were more successful in designing and enforcing their reserve regulations than the government managers in S. Sumatra (Table 4). In the following papers, these same three study sites are shown to have low levels of illegal fishing (see Part 3 - Table 1), the most abundant fish stocks (see Part 3 – Figures 2b, 2c), and high catch rates and economic surpluses (see Part 4). These results support the expectation that the success of the management process will be directly linked to both the biological and socio-economic outcomes that are achieved. This further confirms the importance of focusing on processes as much as outcomes, and avoiding the assumption that a reserve is operating as planned. Such an assumption can, and often does, lead to recommendations on biological design changes that are not the real issues that need to be addressed.

Conclusions

While reserves appear to be potentially useful *technical* tools for fisheries (see Parts 3 and 4), this study has shown that certain conditions and processes are required for their successful management. 'Co-management' is viewed as the best way to make reserves *work*, or to devise alternative and more effective local rules where appropriate. Based on these studies, and on wider experience in other projects, the Management Guidelines produced by the project (Anon, 2000) place strong emphasis on the use of collaborative, participatory principles in the selection, design and management of harvest reserves for river fisheries.

Prospects for the promotion of co-management differ significantly between the provinces studied. Jambi is currently in the strongest position to promote co-management. South Sumatra would require significant changes to its system of allocating access rights (the waterbody auction system) to provide the necessary conditions for co-management. Management options for S. Sumatra are further discussed in Part 4.

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Table 1. Design principles suggested as necessary conditions for enduring local user involvement in common pool resource management (Ostrom, 1991).

1	Boundaries of the resource and those who can use it are clearly defined
2	Appropriation (use or ownership) and provision rules are adapted to local conditions
3	Collective-choice arrangements allow participation of resource users in designing operational rules
4	Rule monitors are the appropriators (resource users) or at least are accountable to them
5	Sanctions (penalties for rule breaking) are graduated, taking into consideration the seriousness and frequency of the infraction
6	Low cost conflict-resolution mechanisms exist to solve disputes
7	Rights of user-communities to devise institutional arrangements are not challenged by external government authorities

Table 2. Community characteristics that lower the costs of institutional supply (e.g. the development of new management rules) (Olson, 1965; Buchanan and Tullock, 1962; Ostrom, 1992; Tang, 1995; and Molnar, Schwartz, and Lovshin 1985).

1	Number of decision makers is low
2	Interests of decision makers and resource users are similar
3	Number of participants minimally necessary to achieve collective benefit is low
4	Presence of skilful leaders or individuals with other assets
5	Presence of individuals willing to undertake entrepreneurial efforts or persuade existing organisations to get involved
6	Presence of shared norms that restrain opportunistic behaviour and create conditions for mutual trust and reciprocity
7	Past institutional decisions of local appropriators lowers the subsequent degree of change implied by new rules
8	Autonomy to change rules exists
9	Presence of enabling external political regime

Table 3. Village characteristics and fishing access arrangements at the study sites, as recorded in the regional reserve survey (RRS).

Comparison Group	Jambi		West Kalimantan				Benawa (S. Sumatra)		Pedamaran (S. Sumatra)	
Study Site	Arang Arang	Danau Lamo	Meliau	Sekolat	Pulau Majang	Teng-kidap	Lebak Nilang	Teluk Gelam	Teluk Rasau	Teluk Toman
Permanent or temporary village?	Perm.	Perm.	Perm.	Perm.	Perm.	Temp.	Temp	Reserve staff only	Temp.	Temp.
Mixed / homogenous?	Hom.	Hom.	Mixed	Hom.	Mixed	Hom.	Hom.	?	?	?
Number of households	173	178	28	167	173	40-60	645	6	Approx. 4,000 (Pedamaran)	
Dependence on fishing	48%	53%	High (90% of households)				15%	None	<10%	
Restrictions on outsiders?	Yes	Yes	Yes	In dry season	In dry season	No	?	–	No	No
Access allocation	Local auction	Local auction	Local lottery	Local lottery	Free	Free	Villa-gers only?	No fished waters	Open auction	Open auction

Table 4. Summary observations on the implementation and compliance with reserve (or other fishery) management rules, as derived from the IA field work.

Rule implementation and compliance category	Province	Field Site (village)
Rules designed, put in place and generally complied with	Jambi W. Kalimantan	Danau Lamo Meliau Sekolat
Rules designed but not put in place (i.e. not working rules)	Jambi S. Sumatra	Arang Arang Lebak Nilang
Rules designed and put in place but not complied with	S. Sumatra W. Kalimantan	Teluk Rasau Pulau Majang Tengkidap