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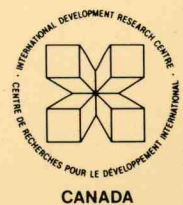
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Reservoir Fishery Management and Development in Asia

Proceedings of a workshop
held in Kathmandu, Nepal,
23-28 November 1987

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ABSTRACT

This publication presents the results of an IDRC-funded workshop held in Kathmandu, Nepal, 23-28 November 1987. Representatives from 15 countries reviewed the status of reservoir fishery research in Asia under the following topics: existing fisheries, limnological aspects, biological and resource aspects, management aspects, and culture. Papers were presented on these topics, but the discussion sessions were the main element of the workshop. Summaries of these discussions as well as a series of general recommendations that were generated during the final discussion are presented in this book. The potential for increased fish production in reservoirs and the need for early involvement of fisheries scientists in the planning and preimpoundment studies before dam construction are emphasized.

RÉSUMÉ

Cet ouvrage présente les résultats d'un atelier financé par le CRDI à Katmandou, au Nepal, du 23 au 28 novembre 1987. Des représentants de 15 pays ont examiné l'état de la recherche sur l'élevage du poisson en étangs en Asie, en particulier les aspects suivants : les systèmes actuels, les aspects limnologiques et biologiques, les ressources, la gestion et l'élevage. Des exposés ont été présentés sur ces sujets, mais les discussions ont été l'élément le plus important de l'atelier. L'ouvrage présente également un résumé des discussions ainsi que les recommandations générales issues de ces discussions. On met l'accent sur la possibilité d'augmenter la production de poissons en étangs et la nécessité pour les ichtyologistes de participer très tôt aux études de planification, notamment de la mise en étangs du poisson, qui précèdent la construction d'un barrage.

RESUMEN

Esta publicación presenta los resultados de un taller auspiciado por el CIID en Kathmandu, Nepal, del 23 al 28 noviembre de 1987. Representantes de 15 países analizaron el estado de la investigación sobre pesquería asiática en embalses desde los siguientes ángulos: pesquería existente, aspectos limnológicos, aspectos biológicos y de recurso, aspectos de manejo y cultivo. Las ponencias versaron sobre estos temas, pero las sesiones de discusión fueron el principal elemento del taller. Este libro ofrece los resúmenes de estas discusiones, así como una serie de recomendaciones generales emanadas de la discusión final. Se subraya el potencial para incrementar la producción pesquera en embalses y la necesidad de una participación temprana de los científicos del área en la planificación y los estudios de apropiación que anteceden a la construcción de represas.

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THE ROLE OF FISHERMEN IN IMPLEMENTING MANAGEMENT STRATEGIES IN THE RESERVOIRS OF SRI LANKA

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Abstract *The socioeconomics of six fishing communities in four man-made reservoirs of Sri Lanka was studied to investigate the potential contribution of fishermen to effective management. Adopting illegal fishing methods and changing fishing grounds are two of the socioeconomic indicators of low income derived from the fishery. The fishermen in all six fishing communities were willing to comply with any fishery regulation provided the fishermen unanimously agreed to the regulation. This suggests that effective management strategies, which will contribute to increasing the fishermen's income, can be implemented through properly organized extension societies in the reservoirs of Sri Lanka.*

In Southeast Asia, about 50% of fish production comes from small-scale fisheries and the management strategies for these artisanal fisheries should be viewed in the context of rural development (Marr 1982). Reservoir fisheries became established in Sri Lanka after coastal fishermen were attracted to the reservoirs in the 1950's because of their high yields. The introduction of the exotic cichlid *Oreochromis mossambicus* (Peters) in 1952 played a major role in the rapid development of the Sri Lankan reservoir fishery, the growth of which is well documented (e.g., Fernando and Indrasena 1969; Fernando 1977; De Silva and Fernando 1980; De Silva 1985). Information on the socioeconomics of these fishing communities (Fernando 1965), however, is scanty. This paper investigates the potential contribution of fishermen to effective fisheries management in the man-made reservoirs of Sri Lanka.

Materials and Methods

The socioeconomic data in this study were collected in November and December 1986 by interviewing fishermen (household heads of fishing families) in four man-made, Sri Lankan reservoirs: Kaudulla, Minneriya, Parakrama Samudra, and Pimburettewa. Because the fishermen are usually reluctant to reveal their actual income, the average daily income per fisherman derived from the fishery was computed from data obtained in a catch-and-effort survey in these reservoirs (U.S. Amarasinghe, unpublished) and from the average price per kilogram of fish at the landing sites. The marketing system at each reservoir was also investigated. Amarasinghe and Pitcher (1986) showed that

fish-stock densities in the northern, middle, and southern basins of Parakrama Samudra were different; therefore, these three basins were treated separately in this study.

Data on the sociodemographic characters of the fishing communities, i.e., average family size, age structure, religion, education level, and nature of fishing occupation (full-time or part-time), were collected. Information pertaining to the fishermen's desire to change fishing occupations, to adopt illegal fishing methods (i.e., beach seining, use of gill nets of mesh size below 76 mm), and to migrate to some other area for fishing was also obtained. The fishermen's awareness of the rational utilization of the fishery resource and their willingness to comply with fishery regulations through an organized fisheries society were also investigated. In Pimburettewa, there is a well-functioning fisheries extension society that was organized by the government. Relevant information from the meetings of this society were extracted from the official records of the Sri Lanka Ministry of Fisheries.

Results

Pimburettewa had the highest percentage of full-time fishermen (92.2%); the southern basin of Parakrama Samudra had the lowest (27.3%) (Table 1). The average daily income per fisherman derived from the fishery ranged from LKR 34 in the southern basin of Parakrama Samudra to LKR 130 in Pimburettewa (in August 1987, 29 Sri Lankan rupees [LKR] = 1 United States dollar [USD]) (Table 2). Except in the southern basin of Parakrama Samudra, the number of fishermen that desired to change their fishing occupation was negligible.

Fishermen in Kaudulla and Pimburettewa indicated that adopting illegal fishing methods such as beach seining, and using gill nets with mesh sizes below 76 mm is unnecessary because their average income is already relatively high (Table 2). Fishermen in the other reservoirs (72.7% in the northern basin of Parakrama Samudra), however, wished to increase their catches using different fishing methods. Furthermore, the desire of the fishermen to migrate to another reservoir or floodplain varied from reservoir to reservoir (Table 2). The percentage of fishermen who wished to change either occupation, fishing method, or location was highest in the northern basin of Parakrama Samudra (100%) and lowest in Pimburettewa (8.3%).

In Pimburettewa, most of the fishermen sell fresh fish to a middleman, who markets it in urban areas, where demand is high. In the other reservoirs studied, the bulk of the catch was sold to fish vendors. During some seasons (especially during low-water months) there is a surplus production of fish at Kaudulla and Minneriya. This surplus, packed in ice, is transported by middlemen to urban areas on the west coast of Sri Lanka.

Although the level of education of fishermen is rather low (Table 1), almost all of them realized the importance of rational exploitation of the fishery resource (Table 3). Practically all the fishermen interviewed indicated a willingness to comply with fishery regulations imposed by the government through a fisheries extension society, either with no conditions (group 1) or with the condition that all the other fishermen are in agreement (group 2) (Table 3).

Table 1. Sociodemographic profile of the fishing communities in four Sri Lankan reservoirs.

	Reservoir ^a					
	K	M	PS			P
			NB	MB	SB	
No. of fishing families	114	95	11	30	11	86
Sample size (household heads)	92	40	11	27	11	84
Average family size	4.6	5.7	5.7	6.0	4.9	5.2
Education (%)						
Illiterate	12.0	7.5	-	3.7	-	1.2
Primary	54.3	52.5	45.5	51.9	54.5	52.4
Secondary	33.7	40.0	54.5	44.4	45.5	46.4
Higher than secondary	-	-	-	-	-	-
Full-time fishermen (%)	82.6	67.5	90.9	85.2	27.3	92.9
Part-time fishermen (%)	17.4	32.5	9.1	14.8	72.7	7.1

^aK, Kaudulla; M, Minneriya; PS, Parakrama Samudra (NB, northern basin; MB, middle basin; SB, southern basin); P, Pimburettewa.

Table 2. Socioeconomic characters of the fishing communities of the four surveyed reservoirs.

	Reservoir ^a					
	K	M	PS			P
			NB	MB	SB	
Price of fish/kg (LKR) ^b	7	8	8	8	8	7
Average daily income per fisherman derived from the fishery (LKR) ^b	74	55	35	53	34	130
Fishermen (%) willing to:						
Change occupation (A)	9.8	5.0	0	0	36.4	3.6
Adopt illegal fishing (B)	0	15.0	72.7	18.5	18.2	0
Change fishing area (C)	2.2	5.0	72.7	33.3	9.1	1.2
Change A, B, or C	9.8	25.0	100.0	40.7	54.5	8.3

^aAbbreviations as in Table 1.

^bIn August 1987, 29 Sri Lankan rupees (LKR) = 1 United States dollar (USD).

Table 3. Fishermen's awareness of the rational utilization of the fishery resource (positive awareness) and their potential contribution in implementing management strategies.

	Reservoir ^a					
	PS					
	K	M	NB	MB	SB	P
Positive awareness (%)	47.8	72.5	100.0	100.0	100.0	100.0
Potential contribution (%) ^b						
Group 1	65.2	32.5	9.1	25.9	36.4	32.1
Group 2	34.8	65.0	90.9	74.1	63.6	67.9
Group 3	0	2.5	0	0	0	0

^aAbbreviations as in Table 1.

^bGroup 1, totally agree to comply with fishery regulations; group 2, agree to comply with fishery regulations if the other fishermen also agree; group 3, do not agree to comply with fishery regulations.

In Pimburettewa, the fishermen's extension society has implemented some positive management strategies: i.e., gradually increasing the minimum mesh size from 76 to 102 mm for the gill-net fishery, limiting the number of fishermen in the reservoir, and allowing only those fishermen who comply with the fishery regulations imposed by the society to fish in the reservoir. All the fishermen interviewed in this reservoir were willing to comply with any regulation that would increase their income. They also believed that the present regulation on minimum mesh size is useful in increasing their catches.

Discussion

Fishery management is usually mainly concerned with the rational exploitation of the fishery resource. However, it must be remembered that the participation of the fishermen is essential in implementing management strategies, especially in the artisanal fisheries of developing countries. This study indicates that any fishery regulation imposed by the government could only be effectively implemented through fishermen's participation. Nevertheless, organizing fishermen to form an extension society is possible only if they see obvious benefits in their participation.

The Pimburettewa Reservoir is good a example of how a functional fisheries extension society can positively influence the fishermen's income. This reservoir is situated in a relatively remote area. Therefore, an efficient method is essential for the disposal of surplus fish. The middleman plays a major role in this disposal. Also, because the middleman prefers large, fresh fish, which are more acceptable to the urban consumer, the fishermen tend to catch larger fish. The monthly mean landing size of *O. mossambicus*, which is the dominant species of the commercial fishery, range from 24.5 to 26.3 cm and the fishery of this reservoir has been shown to be optimally

exploited (Amarasinghe 1987). The average daily income per fishermen (LKR 130) is the highest of all the reservoirs studies (Table 2). Being an active member of the extension society, the middleman is also involved in imposing fishery regulations. Although the middleman is motivated to increase his personal income by exploitation of the fishery resource, the fishermen equally benefit by increasing their catch. The existence of a successful fisheries extension society in Pimburettewa with minimal government intervention is a unique situation. Nevertheless, this system of management could be adopted in other reservoirs with active government mediation.

At the Kaudulla and Minneriya reservoirs, however, the disposal of surplus fish is unimportant to the middlemen. The main source of income for the middlemen at these reservoirs is marine fish marketing; freshwater fish only become important to them when the marine fish production is poor. Therefore, the middlemen are unconcerned with the rational utilization of the fishery resource and the introduction of a middleman to such a reservoir could be detrimental.

Although the Ministry of Fisheries has organized extension societies in most major reservoirs in Sri Lanka, only a few function effectively. This study shows that practically all the fishermen are willing to comply with fishery regulations provided there is collective agreement among the fishermen. Therefore, the organization of fishermen into functional, effective extension societies will be helpful in implementing fishery regulations. Furthermore, by introducing insurance policies, maintaining effective marketing structures for fish catches, etc., the fishermen benefit directly from the society. Guidelines for the establishment and operation of extension societies can be found in Ben-Yami and Anderson (1985).

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